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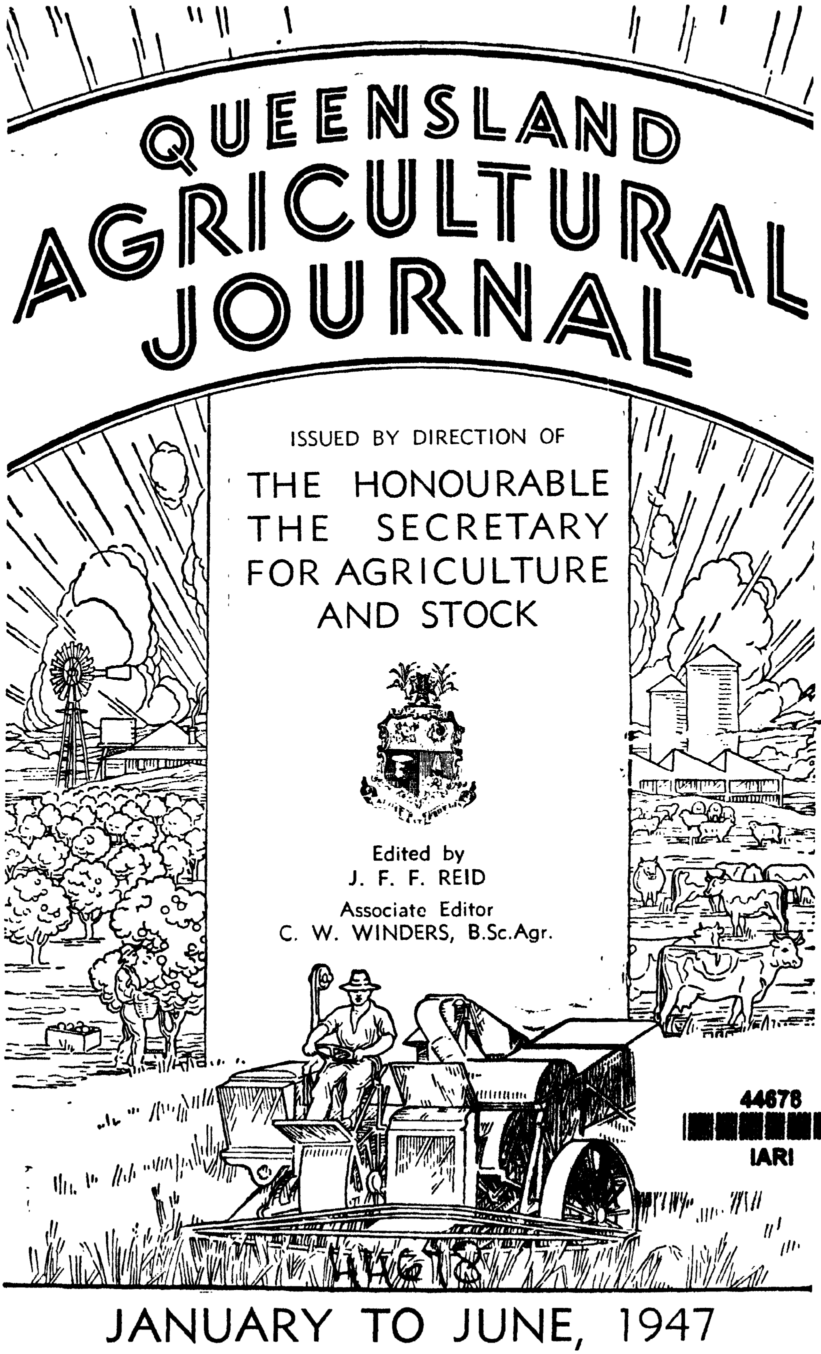
Volume 64

QUEENSLAND AGRICULTURAL JOURNAL



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THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK

Edited by
J. F. F. REID

Associate Editor
C. W. WINDERS, B.Sc.Agr.

JANUARY TO JUNE, 1947

Vol. 64 Parts 1 to 6

QUEENSLAND AGRICULTURAL JOURNAL

GENERAL INDEX.

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Volume 64 Part 1

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Issued by Direction of
THE HONOURABLE H. H. COLLINS
MINISTER FOR AGRICULTURE AND STOCK

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Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling, members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

Volume 64 | 1 JANUARY, 1947 | Part 1

Event and Comment.

Fodder Conservation.

SOIL and climatic conditions in the agricultural districts of the State are generally favourable to the production of many summer fodder crops, yet the quantity stored annually is far below ordinary winter requirements. Winter rainfall is often an uncertain quantity, consequently the planting of seasonable crops for grazing cannot be undertaken with any assurance that they will provide sufficient winter feed. Summer fodder crops, however, can be sown with greater confidence and from them a much greater bulk of green feed can be produced and the surplus stored for dry-time use.

In the early days of dairying in Queensland, particularly on the richly fertile soils of the rain forest regions, the growth of sown pastures was so luxuriant that the need for fodder conservation was not felt, although the rate of stocking was then considerably higher than in later years. The gradual decline in the carrying capacity of even the richest lands through the depletion of soil fertility, impaction caused by heavy stocking, the root-binding of old swards and other causes has since made fodder conservation a necessity on most dairy farms. A similar serious reduction in the carrying capacity of native pastures also has occurred. For these and other cogent reasons, a silo or some other satisfactory system of stock food storage has become an essential factor in profitable dairy farming.

A committee of experienced technical officers of the Department of Agriculture and Stock has been set up to deal with the practical aspects of conservation and through which will be channelled advice and guidance on the various ways and means of providing reserves of stock feed for use in time of need.

THE MINISTER'S NEW YEAR MESSAGE TO THE FARMERS OF QUEENSLAND

DURING the past year agriculture, in common with other industries, was faced with the necessity of making many post-war readjustments. In addition to the difficulties of this transitional period, seasonal adversity was a cause of serious hardship. The obvious lesson of the dry season is bound up with the wisdom of adequate fodder and water conservation. Practical assistance from my Department in respect of ways and means of providing for stock food storage is at the call of farmers throughout the State. The Government is fostering many projects, besides those already completed, for water conservation, which will have a direct bearing on the improvement of conditions in rural industry.


Plate 1.
Hon. H. H. Collins

Far-reaching legislation has been enacted for the economic development of our land and water resources, for it is realized that no country can thrive without a prosperous agriculture—a prosperity based on better farming and better living.

In the year just ended further substantial progress was made in the extension of Queensland's rural policy—a policy embracing the effective peopling of our country districts; sound technical instruction in both new and established industries; the strengthening of advisory services, aiming at improvement in cultural methods and the raising of livestock standards; a wider acceptance and application of the principles of agricultural economics; the promotion of scientific research; and beneficent legislation. Without, however, the active and intelligent co-operation of all concerned but little progress could be made. It is for farmers themselves to study carefully the problems of the field and of the market. Where practicable, it is for them to apply the results of our mutual efforts in community and national service.

We have a great country—one of the finest in the world—in which people may live more happily, healthily, longer, and in many ways better than anywhere else; with faith in ourselves and confidence in Queensland we may look forward to yet another year of progress and achievement.

I wish the farmers of Queensland all good in the coming year; that prosperity will be brought to their homes and happiness to their families; that they will be blessed with a full realization of all their hopes; and that success will continue through a long and fruitful future.

H. H. Collins

Secretary for Agriculture and Stock.

Department of Agriculture and Stock,
Brisbane, 1st January, 1947.

Notes on Kudzu.

T. G. GRAHAM, Q.D.A., Adviser in Agriculture.

KUDZU (*Pueraria Thunbergia*) is a native of Japan, and has figured prominently in the soil conservation programme of the United States of America within recent years. The plant was brought into Queensland many years ago, and although it made excellent growth in parts of Southern Queensland it did not become popular and eventually went almost out of cultivation. In view of reported successes in America, fresh introductions were made and trial plantings were placed out along the coastal belt of this State. Climatic conditions over a large portion of this coastal area resemble those experienced in the south-eastern States of the United States of America.

The legume has not been under farm trial sufficiently long to enable its likely value in Queensland to be determined. On the tropical north coast it is inferior to *Puero, Pueraria phaseoloides*, a closely related plant, but as it has a higher frost tolerance than Puero, it would prove more satisfactory in the sub-tropical districts. This has also proved to be the case in other countries. There has been a steady demand for information concerning Kudzu, and the following notes on its characteristics, culture, and uses, gleaned largely from overseas reports, should serve as a guide to farmers contemplating planting the legume in Queensland.

Habit of Growth.

Kudzu is a deep-rooted perennial legume with large, starchy roots. It is a vigorous vine capable of forming a dense cover of leaves and stems over the surface of the ground. As the leaves fall they form a layer of litter that reduces run-off and, being held firmly in place by a network of stems securely anchored to the ground by roots at frequent intervals, present a perfect barrier to scouring. The plant is deciduous and even under conditions at South Johnstone (minimum screen temperature 40 deg.) is completely bare of leaves for several months during the winter. Extensive root reserves enable the plant to make good spring growth even in dry weather. In the initial stages growth is somewhat slow, but, under suitable conditions during the second year and thereafter, it becomes rampant and the vines may reach a considerable length during a single growing season.

Soil Requirements.

Kudzu is reported to have a wide range of soil adaptation, but it will not grow on low-lying, badly drained land or on soils of a sandy nature, low in available plant food. It prefers soils which are neutral

to acid, and is growing successfully at South Johnstone on soils with a pH as low as 4·5. A feature of the plant in the United States of America is that with proper care it can be established on scoured land from which much of the surface soil has been removed by sheet erosion.

Climatic Range.

This plant has a fairly wide climatic range, and it is probable that it can be grown throughout the Queensland coastal belt and in some of the adjacent drier country. It is not likely to prove satisfactory in areas where frequent extremely heavy frosts are experienced, nor in hot districts with a high rainfall throughout the year.

Methods of Establishment.

Kudzu is propagated mainly by means of rooted stems, but it will grow from crown buds or buds at the nodes of the stems, and also from seed. Seed setting is usually light. In any case, little success has been obtained in raising plants from seed, as the seedlings appear to be weak and are subject to damping off, while the growth is extremely slow. Further, more careful hand cultivation is necessary in the case of seedlings than is practicable under field conditions.

A piece of stem carrying from two to three nodes, one at least of which has commenced to develop roots, provides a ready means of establishing the plant. Young crowns dug from fields of established stands are probably the safest means of establishment, but these are more difficult to obtain than cuttings. Five hundred such crowns are sufficient to plant one acre. In all cases of establishment best results are obtained when the buds are dormant. Green softwood is of no value for planting material.

The sets are established by placing them in holes made by a mattock and firming the ground around them by means of the foot. Where large areas are intended for planting furrows should be opened up at convenient distances for cultivating, usually between 10 and 12 feet, and the cuttings dropped in the furrow at intervals of from 6 to 12 feet, making sure that one bud is left above the surface of the ground. The furrow is then closed, and the land smoothed out by means of discs or harrows. It is important that the ground is moist at the time of planting, and, if sufficient soil moisture is not present, water should be applied in the hole just prior to planting. Under large scale conditions, planting should not be attempted unless sufficient moisture is present to enable the young roots to strike quickly.

Soil Preparation and after Treatment.

A good root system is essential to enable the plant to stand up to drought, and in order to encourage this considerable attention should be given to the preparation of the field. A deep ploughing is the first step in this direction. This should be done sufficiently in advance of planting to enable the soil to mellow down into a fine tilth.

After planting, the land between rows should be kept loose and free from weeds to enable the runners to root readily and obtain a firm hold. If weeds are allowed to become troublesome, layering of the vines is interfered with. Heavy layering is essential from a grazing standpoint, since it is from the layers that the density of the surface growth

springs. Where weeds have become troublesome, the entire area can be disced provided a good stand has been established. The discs should be set just sufficiently to remove most of the weeds yet with insufficient cut to destroy the rooted vines.

Kudzu Hay.

Kudzu makes hay of an excellent quality and with a feeding value reputed to equal that of lucerne. A perennial with a capacity for storing large quantities of food in its roots, it has an advantage over annual hay crops in that it is less dependent on seasonal conditions. It is usual to expect one good cutting each year, yielding about 2 tons of cured hay per acre. The vines should be cut during the summer when the growth has reached a height of about 2 feet. Difficulty is sometimes encountered in mowing, and it is best to raise the blade so as not to damage the prostrate stems and to use a tropical legume attachment—a device for making a clean cut along the edge of the swath.

Since it makes rank growth, forks are sometimes used instead of rakes, but the vines can be raked quite satisfactorily by means of the ordinary dump rake. Under good curing conditions, the hay can be cured in 3 days if mowing is delayed in the morning until the leaves are free from surface moisture. It is advisable to leave in the swath for a few hours and then put into windrows. If turned next morning after the dew is off the hay can usually be carted in the following afternoon.

Grazing Kudzu.

Kudzu would be of great value to Queensland farmers and graziers if it could be successfully established on waste portions of the farm unsuitable for any other crop, as it is on many American farms, where it provides valuable feed when other crops have begun to dry off.

It is extremely palatable and stock take to it so readily that care has to be exercised to see that the area is not over-grazed. Continuous grazing can destroy a stand, particularly if stock are allowed to graze it closely. On no account should grazing be commenced before a solid stand, at least two years old, has been established. Grazing of Kudzu just prior to milking may cause a slight taint.

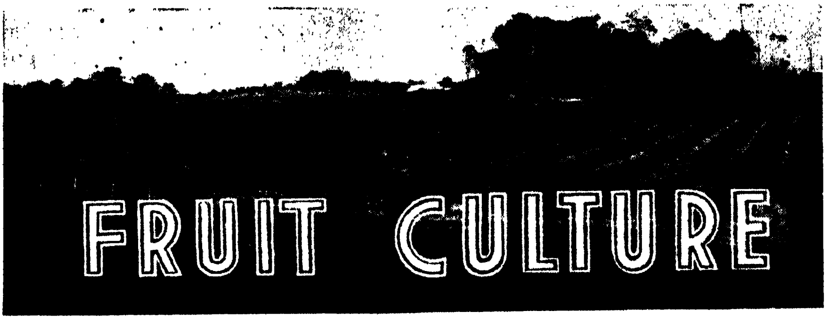
No local evidence is available as to the use of this plant for livestock other than horses and cattle, but in the United States of America pigs have been successfully raised on Kudzu pastures, and it appears likely that it may prove a useful source of protein for poultry.

Erosion Control.

Kudzu first came into prominence as a soil conservation crop and has been used extensively for the control of erosion in various parts of the world, principally the United States of America. It has been used with great effect in the healing of badly scoured gullies, on steep slopes to hold soil from washing, and in the re-establishment of lands where the surface soil has been washed away. It has also been found useful for the protection of banks of streams and for holding loose soil on built-up highways.

Eradication.

Kudzu is not regarded as being a likely pest plant. It has been shown to be easily eradicated by ploughing and cultivating and also by close continuous grazing.



Avocado Varieties.

H. M. GROSZMANN, Assistant Horticulturist.

IT is only during recent years that the avocado has become of any commercial importance in Queensland, and the industry is still quite small. Consequently, both in production and in marketing there is much to be learnt. At present, a critical factor is the choice of varieties for commercial growing, and it is fortunate that the industry is still small enough to be set on the right path without undue loss.

It is not intended here to give any final recommendations on the choice of varieties, but only to draw attention to this very important aspect of the industry, to point out some errors, and to outline some general principles of improvement. While the principles will continue to hold good, it is expected that recommendations will change from time to time as new varieties are tested for local adaptation and general suitability for commercial requirements.

Inferior Seedlings Hamper the Industry.

At present at least half the trees grown commercially are seedlings, and on the whole their effect on the industry is bad. The few seedlings which are good regular bearers usually produce fruit which is definitely inferior to that of the better American varieties now available.

The growing of numerous seedlings varying widely in fruit type greatly complicates both production and marketing. It is almost impossible for the grower to master the cultural and marketing requirements of so many seedling types; and the marketing of such a range of varieties, many of them inferior, confuses and often disappoints the consumer. In short, standardisation of varieties is the industry's greatest need. The number of varieties must be reduced to a minimum, and they must be the best available.

The first essential is for the grower with mature seedling trees to recognise those which are definitely inferior. Trees may be inferior for two main reasons:—Either they are shy bearers or they bear poor fruit. Once these trees are recognised they can be grafted over to the best proven varieties, when they will generally be cropping again in two or three years' time. While the operation of grafting requires considerable care, it can be carried out by any capable grower, and advice can be obtained from the Department of Agriculture and Stock. By attending to this, growers will raise the industry to the level of the best varieties now known.

Continued Search for Better Types.

Even this is not enough, however, for no existing variety completely meets all commercial requirements, and none is ideally suited to production in every locality. Consequently, there is a need to develop better varieties and varieties better adapted to diverse localities. Such

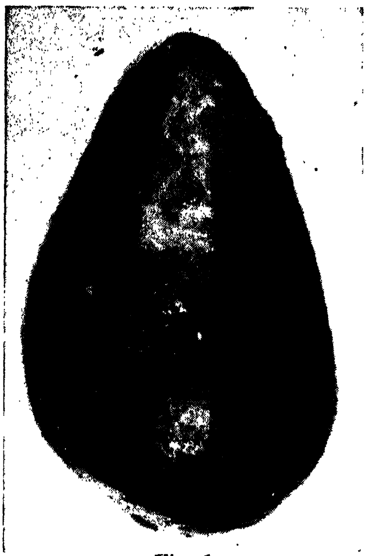


Fig. 1.

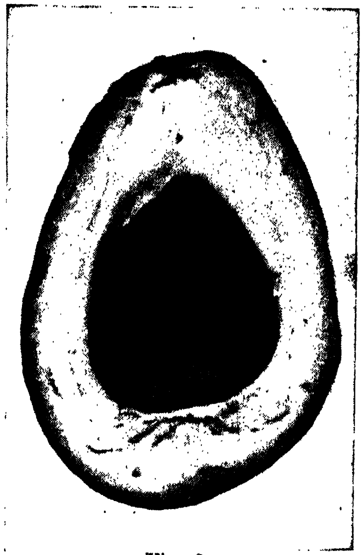


Fig. 2.

Plate 2.
FRUIT OF FUERTE AVOCADO.

improvement may be achieved by testing new varieties from overseas, by combing present seedling orchards for promising trees, and by continuing to raise seedlings from the best varieties.

In regard to the importation of trees or budwood of new varieties from overseas, a warning must be given against the possible introduction

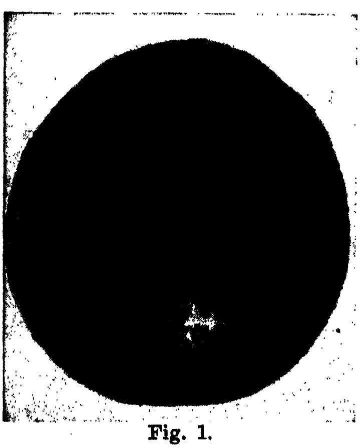


Fig. 1.

Fig. 2.

Plate 3.
FRUIT OF NABAL AVOCADO.

of serious diseases such as sun blotch. Any grower noticing any unusual disease symptom in imported trees, or for that matter in any trees, would be well advised to inform this Department.

It is quite likely that in bearing seedling orchards there may be trees of desirable type especially adapted to the locality and bearing fruit of good quality. Growers who have such trees might inform the Department, when the trees could be placed on register and their value assessed. Here it must be noted that even rough annual records of cropping of individual trees are of great value in indicating the yield of a tree and its reliability as a cropper.

While it is obviously not economic for a grower to raise large areas of seedlings and grow them to maturity in search of better varieties, it would be of considerable help if many growers planted a few seeds either selected by themselves from the best varieties or supplied by the Department.

Selecting a Variety.

Avocadoes vary widely and in many ways, and it is necessary to know what are the main points to be considered in selecting a variety. They are summarised here as follows:—

(*a*) Marketability;
(*b*) Yield;
(*c*) Cold hardiness;
(*d*) Vigour;
(*e*) Freedom from disease;
(*f*) Season of maturity;
(*g*) Pollination.

Marketability.

Under marketability come such factors as flavour and texture, fruit size, and percentage of flesh. On the American market it is considered that about 12 oz. is the ideal size. In regard to flavour, it is significant that the rich, nutty flavour of the Fuerte is most popular.

The seed should be small and tight in the cavity, and the skin should not be too thick, as this makes it difficult to determine when the fruit is ready to eat. The flesh should be free of fibre, and should not discolour too rapidly upon cutting. Finally, the fruit should be uniform and of attractive appearance.

In assessing the value of a fruit, it is important not to lay too much stress on any one characteristic, particularly when that characteristic has little or no bearing on quality; and here the consuming public needs to be educated, too. Unfortunately, consumers, ignorant of the true facts, have associated quality with quite unrelated features. For example, the market, recognising the excellent eating quality of the Fuerte variety, has concluded that all fruit that are green and pear-shaped like the Fuerte must be just as good to eat, while all that are not pear-shaped and green must be inferior. Thus the Nabal, an excellent fruit, is rejected because it is round, while some worthless pear-shaped seedling brings top price; and the Benik, a fine fruit, is dumped because it is purple. The obvious remedy is to market good varieties under their varietal names, along with a little instructive publicity, so that the consumer will come to know the varieties and give up associating quality with quite irrelevant characteristics. With this end in view a list of approved varieties could be established, along with appropriate quality and maturity standards, so that the varietal name

would be a guarantee of quality. It is not suggested that seedlings be excluded from the market, but that they should not be marketed under any varietal name until they have been placed on a Departmental register with a detailed description so that only one type could be marketed under the one name. In this way any promising seedling could undergo the test of the market. In the course of analysis and description of the fruit it would be possible to advise growers whether the variety was worth propagating.

Yield.

From the growers' point of view high yield is obviously desirable and regular cropping a great asset. Even the excellent Fuerte variety falls short of this ideal in its main areas of production, as it tends to bear heavy and light crops alternately. It is important to keep yield records of the different varieties.

Constitution and Habit of Growth.

As avocadoes are susceptible to injury by frosts where low temperatures are at all likely, resistance to cold is desirable. Here it may be remarked that there are three main races of avocadoes—the Mexican, the Guatemalan, and the West Indian, given in order of their resistance to cold, the West Indian being the least tolerant. The main varieties on the market are either Guatemalan or Guatemalan-Mexican hybrids. It has been observed that even within the one race there is quite marked variation in cold hardiness.

The tree should be sufficiently vigorous to bear a large crop and to do this without any marked setback in growth. Freedom from disease must not be neglected, as it saves expensive control measures and losses inevitably incurred with disease susceptible varieties. Habit of growth is important, too. A low, compact habit of growth is preferable to a very tall or straggling habit, as it facilitates cultural operations. It is also an advantage to have a tree that is not easily damaged by wind.

Season of Maturity.

If the avocado is to become a regular article of diet and not merely a luxury it will be an advantage if varieties can be found which will extend the supply of high-grade fruit throughout the whole year.

Pollination.

A rather unusual feature of avocadoes is that, quite independent of race, they consist of two distinct groups of varieties based on flower mechanisms which differ in such a way that a flower from one group is generally pollinated in nature only by pollen from a flower of the other group. The two groups are called A and B, and generally to obtain a good set of fruit it is necessary to have trees of both groups present in an orchard in close proximity to one another, and either having their peak flowering at the same time, or at least with their flowering periods overlapping.

The above question of pollination is still rather obscure, and there are notable exceptions in the behaviour of certain varieties overseas under special climatic conditions. Still, in the absence of sufficient information on the behaviour of varieties in Queensland it is best to be on the safe side and include varieties from both groups in any one planting.

Varieties Recommended.

In a general way, the above outline has shown that the industry in Queensland is hampered by the presence of too many inferior seedling trees; the immediate steps that should be taken to remedy this have been indicated, and also the main objectives that must be kept in mind in improving the stock and standardising the industry. Some concrete recommendations can now be given. These are based on observations made on several varieties in Departmental plots in the Maroochy Shire. The varieties in question were originally selected on their place in the Californian industry, and on their performance at Tamborine Mountain. There are some more recently introduced American varieties from both California and Florida, and also some promising local seedlings which are worth watching, but they cannot be included here as they have not yet been carefully studied.

It is believed that the two best varieties available are the Fuerte and the Nabal, and that these should constitute the bulk of plantings in the near future. Most inferior seedlings should be worked over to them.

The Fuerte has a green, pear-shaped fruit averaging about 12 oz. in weight. The flavour is excellent, the seed small, and the skin is fairly thin. The fruit matures approximately from the middle of April to the middle of August. The tree is low-growing, large, and fairly frost resistant. There is some indication that it fruits better on the basaltic plateaus than on the lower coastal areas.

The Nabal bears a large, round, green fruit, also of excellent quality. The seed is small and the skin thick. The fruit is rather larger than is considered ideal for the market, but its eating quality compensates for this. The tree is large and of good shape, though sometimes a little tall growing. It is not as frost resistant as the Fuerte. Heavy crops have been observed on both the lowlands and the red soil plateaus. The season of maturity is roughly during October and November.

These two varieties leave fruit in low supply in August and September, and also in December, January, February, and March. Furthermore, as they are both of Group B, pollinators from Group A are required.

Two A group varieties, Anaheim and Benik, will bridge the August-September gap, as both mature their fruit at this time. However, while they will help, they are not ideal pollinators as both are mid-season blossomers, while the Fuerte is very early and the Nabal very late. The Anaheim is very prolific and a regular cropper, but its fruit is not quite as good as that of the Benik. The fruit of the Benik is purple when mature. Both varieties are susceptible to frost injury.

So far as is known, suitable varieties maturing their fruit from December to March are not available, but it is possible that some of the late Guatemalan and early West Indian varieties may be found to fill this need.

The Department intends to continue the study of avocado varieties, and it is hoped that more information will be available before very long. However, as a variety must be observed for several seasons before its value can be assessed, it will take time to gather reliable information. In this matter the growers can assist greatly by keeping even the simplest records.

APPLIED BOTANY

Plants Poisonous to Sheep.

S. L. EVERIST, Assistant Botanist.

Introduction.

THIS article makes no attempt to describe all the plants in Queensland which are poisonous to sheep, but it does include those most commonly regarded as responsible for plant poisoning in the sheep-raising districts.

Each plant is treated under the following headings:—Common names, botanical name, description, distribution, seasonal occurrence, evidence of poisoning, symptoms, post mortem, prevention and treatment.

Much of the veterinary information has been provided by officers of the Division of Animal Industry.

General Notes on Plant Poisoning.

When investigating cases of suspected plant poisoning, several things must be considered. The most important points to note are:—

1. The kinds of plants eaten by the animals.
2. The condition of the plants.
3. The stage of growth of the plants.
4. The physical condition of the animals.
5. The routine being followed by the animals (grazing, travelling, etc.).
6. The previous history of the animals.
7. Seasonal conditions.
8. Weather conditions at the time and for several days beforehand.

1. *Kinds of plants.*—Some plants are known to be poisonous to stock, others are suspected but without definite proof, and others are known to be harmless. The first step is to find out what the animals have been eating. This may be done in two ways: (*a*) by detailed study of the paunch contents; (*b*) by careful examination of areas where the animals have been grazing.

Identification of paunch contents is usually difficult and sometimes misleading. By careful study, a botanist can identify most of the plants in the paunch of a freshly killed sheep, but if decomposition occurs identification is often quite impossible. It is important that paunch contents be fresh when examined.

Examination of paddocks or stock routes grazed by affected animals often reveals the cause of the trouble. Notes should be made carefully of the extent to which various plants have been trimmed. Such notes should be sent to the Government Botanist with specimens of the plants.

Specimens for identification should bear either flowers or fruits ("seeds") if these are available. If not, a good-sized sample of leaves and twigs should be sent. All samples should be accompanied by brief notes on the general appearance of the plant, the type of country, and the kind of soil.

2. *Condition of plants.*—With some plants, it is important to know whether they are green and succulent or old and dry. For example, plants which yield prussic acid, such as native couch grass and fuchsia bush, are most dangerous when green and succulent.

3. *Stage of growth.*—Some plants (for example, noogoora burr) are poisonous when seedlings but not when mature; others, such as heart-leaf poison bush, are said to be safe in the seedling stage but poisonous when mature.

4. *Condition of the animals.*—The physical condition of the animals is very important. Prime, well-fed sheep may eat quite safely some plants that would kill poor, hungry sheep. Hungry sheep often eat plants which are left untouched by well fed sheep. Mortalities on native couch grass near St. George provided a good example of this. Deaths occurred only in very hungry sheep travelling from a bare stock route. Well fed sheep from a better grassed route passed along the same lane without loss.

Though as a general rule hungry sheep are more susceptible to plant poisoning than others, with a few plants only prime animals are affected.

5. *Routine.*—It is important to know whether animals are grazing quietly in the paddock, travelling along a stock route or being mustered or handled in yards. In general, any handling of sheep increases the risk of losses through plant poisoning.

6. *Previous history.*—After eating certain plants such as Ellangowan poison bush the animals may show no symptoms for some time, often several days. Therefore, when searching for poisonous plants, stock routes should be examined over the distance travelled by the animals during the three days before deaths occurred.

A drink of water may hasten the onset of symptoms so it is well to note when and where the animals were watered.

Driving sometimes causes symptoms to appear which otherwise would not show, for example in "humpyback" only driven animals show symptoms.

Loud noises and sudden fright bring on symptoms of yellow-wood poisoning in sheep.

The history of sheep unloaded from railway trucks is specially important. Such sheep are very susceptible to plant poisoning. Even with paddock sheep, history can be important, as will be explained under paragraph 8.

7. *Seasonal conditions.*—In some plants the amount of poison fluctuates from month to month and from year to year. The actual nature of this seasonal variation has been worked out for a few plants and similar variation is believed to exist in many others which have not yet been studied critically.

8. *Weather conditions.*—In certain circumstances, weather can be a potent factor in causing mortalities in sheep. For example, the following case was noted in the Blackall district some years ago. For several months, strong wethers had been running in a paddock containing gidyea with some open grassy plains. Along the fringe of the timber were many well-grown fuchsia bushes, which were kept fairly well trimmed by the sheep. During one week there were two days of cold, drizzling weather and the sheep remained huddled in the timber, not feeding out. On the third day the weather cleared and the sheep left the timber and ate the fuchsia. A great number died. The sheep were hungry, there was some young growth on the bushes and the leaves were wet. All these factors helped to make the plant more dangerous, and in combination they proved fatal even to sheep accustomed to eating the plant.

Prevention and Treatment of Plant Poisoning.

It is better to prevent plant poisoning than to try to cure affected animals. The first essential is to recognise the plants responsible so that steps may be taken to avoid them. In known "poison" country, it may be possible to devise a system of management whereby losses can be reduced to a minimum. This applies particularly to unpalatable plants which are eaten only when other feed is scarce. Where possible, paddocks containing many of these plants should be grazed in flush seasons when other feed is plentiful. Comparatively safe country may then be reserved for drier times.

Remedies are available for only a few kinds of plant poisoning. Their effectiveness depends upon correct diagnosis and quick administration. The following three remedies are recommended by the Department:—

(*a*) *Hypo treatment*: Used when animals are suffering from prussic-acid poisoning caused by eating plants such as fuchsia bush, boonaree, native couch grass, and red crumbweed.

Sodium thiosulphate (photographic hypo), 5 ounces (avoirdupois).

Water to make 1 pint.

Drench once per day with 2 fluid ounces of the solution.

(*b*) *Methylene blue treatment*: Used when animals are suffering from methaemoglobinaemia (a condition in which the blood cannot take up oxygen) caused by eating mint weed or other plants containing excess nitrate.

Make up 0.9 per cent. saline solution as follows:—

Sodium chloride (salt), 9 grams or 138 grains.

Distilled water to make 1,000 cc. or 35 fluid ounces.

When dissolved, add methylene blue as follows:—

Methylene blue, 6 grams or 92 grains.

Saline solution to make 1,000 cc. or 35 fluid ounces.

Dose.—10 cc. injected beneath the skin or into a vein. A second treatment may be necessary.

(*c*) *Calcium borogluconate treatment*: Used to treat hypocalcaemia (deficiency of calcium in blood) in animals suffering from soda bush poisoning.

Calcium borogluconate, 200 grams or 7 ounces (avoirdupois).
Warm water (distilled), 1000 cc. or 35 fluid ounces.
Dose.—30 to 50 cc. injected beneath the skin.

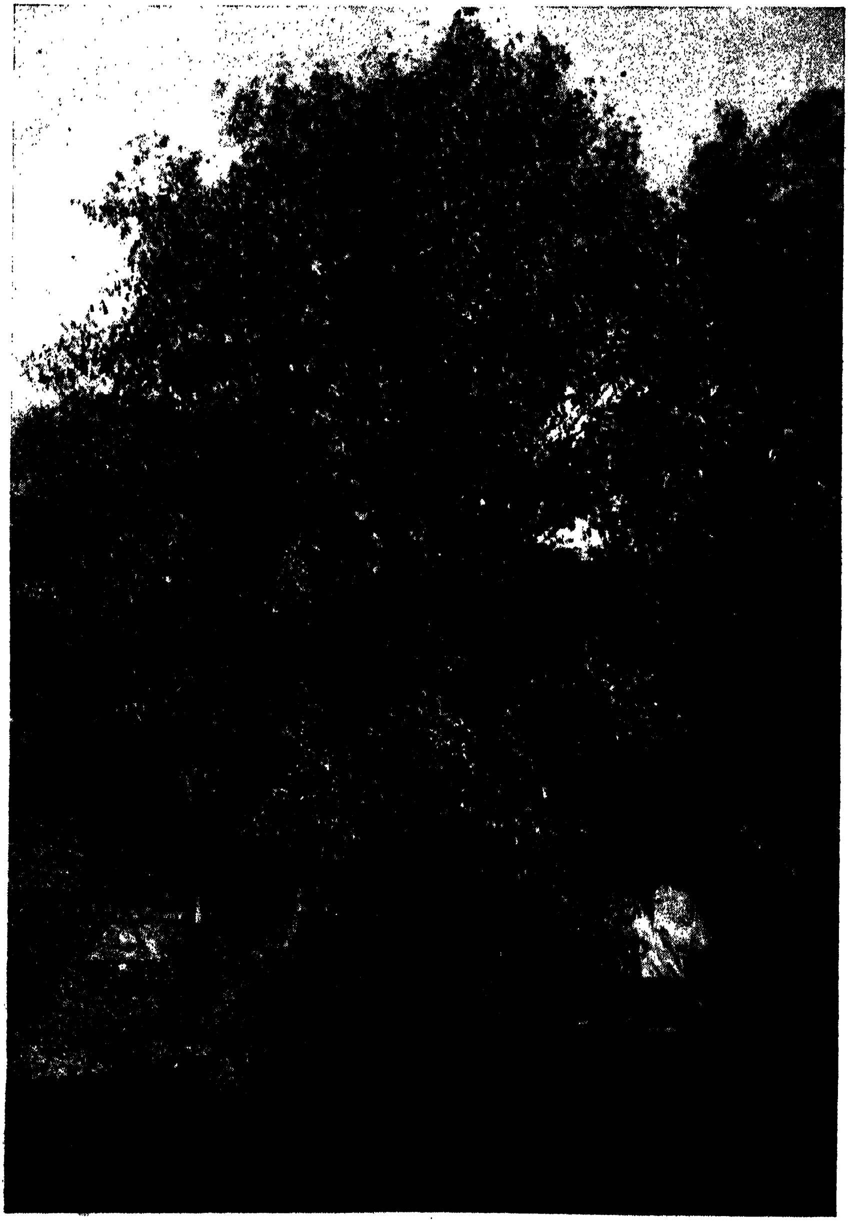


Plate 4.
YELLOW-WOOD.—Mature tree, Emerald.

Arrangement.

The plants have been divided into four categories and arranged in the following order:—

Trees: Yellow-wood, boonaree.

Shrubs: Fuchsia bush, heart-leaf poison bush, Ellangowan poison bush.

Vines: Caustic vine, weir vine.

Herbs and Grasses: Soda bush, mint weed, wild sunflower, sunflower daisy, darling pea, dwarf darling pea, thorn apple, wild tobaccos, caustic creeper, bottle-tree caustic, flax weed, common native couch, andrachne, red crumbweed, malvastrum, wild parsnip, plants causing photo-sensitisation.

Yellow-wood.

Other Common Names: None reported. The plant should not be confused with the tall timber tree of the same name found in coastal rain-forests.

Botanical name: Terminalia oblongata, F. Meull.

Description: Bushy, deciduous tree up to 25 feet high; bark grey, furrowed; wood yellow, fine-grained; leaves alternate, often in clusters along the branches, bright green when young, becoming yellow or reddish when old, 1 to 1½ inches long, oblong, rounded or slightly notched at the tip; flowers small and inconspicuous, fruits up to 1 inch in diameter, greenish yellow, with dry wings. (Plate 4.)

Distribution: So far as is known, this tree grows only in the area drained by rivers of the Burdekin and Fitzroy systems. It is found mainly in mixed forest country, on soils ranging from heavy clay to sandy loam.

Seasonal Occurrence: In dry years, trouble may be experienced at any time. In good years, most cases occur in the dry months from June to December.

Evidence of Poisoning: (*a*) Field: For many years the plant was suspected of causing a peculiar staggers in sheep. Field surveys carried out in 1940 and 1941 by departmental officers* suggested that it might be the cause of Mackenzie River disease in cattle.

(*b*) Feeding tests: In 1934, sheep given as much yellowwood leaf as they would eat for periods ranging from 5 to 8 weeks exhibited symptoms similar to those observed in the field.† In feeding tests at Clermont in 1944 with young Shorthorn cattle symptoms were produced similar to those of Mackenzie River disease as seen in the field.‡ First symptoms were noticed in from 10 to 20 days after feeding began.

Symptoms: In sheep, symptoms appear only when the animals are frightened, as, for example, by loud noises. The symptoms have been reported as follows† :—"The sheep drops in its tracks as though stunned

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* Irving Marshall: Unpublished reports, Department of Agriculture and Stock files, 1940-1941.

* Francis, W. D.: Unpublished report, Department of Agriculture and Stock files, 1941.

† McIntosh, K. S.: Queensland Agricultural Journal, Vol. 42, p. 727, 1934.

‡ Legg, J., Moule, G. R., and Chester, R. D.; Queensland Journal of Agricultural Science, Vol. 2, p. 199, 1945.

and lies trembling and rigid with extensor muscles of the neck and limbs strongly contracted. The sheep sometimes lies quite prone and sometimes props itself up and sways its head from side to side. The attack lasts for 10 to 40 seconds and recovery is quick. The sheep struggles to its feet and stands for a few seconds swaying unsteadily, then runs away to join the mob." No deaths from yellow-wood poisoning have been reported in sheep, but some mortalities have occurred when sheep have taken fits on the edges of waterholes or dams and have fallen in and been drowned. In the yards, affected sheep may take fits when being handled.

The following symptoms have been observed in cattle*:—At first, there is continuous blinking and marked disinclination to stay in the sun. There is a thin, yellowish discharge across the face which mats the hair. Later, the head is held high. In some cases sight is probably impaired and the animal lifts its forefeet a little higher than normal. The muzzle becomes inflamed and cracks and incrustations appear. There may be a slight discharge from the nostrils. Sometimes there is a swelling under the jaw and in the brisket region. Urination is more frequent than normal and occasionally there is almost continuous dribbling.

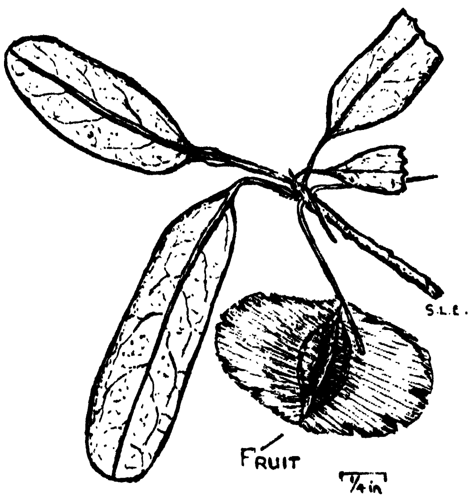


Plate 5.
YELLOW-WOOD.—Twig with leaves and fruit.

Post Mortem: No post mortems are reported for sheep. In cattle, the main changes are in the kidneys which show a peculiar discolouration, ranging from greenish-blue to slate-grey and considerable congestion.

Prevention: The tree is so plentiful that eradication is impossible. Sheep running on yellow-wood country should be disturbed as little as possible. If country free from the tree is available, it should be reserved for dry periods and the yellow-wood country stocked when grass and herbage are plentiful. Sheep on good grass rarely eat enough yellow-wood to cause trouble.

Treatment: No remedial treatment is known.

* Legg, J., Moule, G. R., and Chester, R. D.; Queensland Journal of Agricultural Science, Vol. 2, p. 199, 1945.

Boonaree.

Other Common Names: Dogwood, rosewood, red heart.

Botanical Name: *Heterodendron oleifolium* Desf.

Description: Bushy tree up to 25 ft. high; bark dark grey, furrowed and broken into rough flakes; sapwood yellow; heartwood reddish-brown; leaves alternate, pale, dull green, up to 3 in. long, veins well marked; flowers inconspicuous, pale green; fruits in clusters, 1-4 celled, cells rounded, green, about ½ in. across (Plate 6).

Plate 6.
BOONAREE.—Mature tree, Blackall.

Distribution: The tree is very common in central and south-western Queensland and is also plentiful in western New South Wales. It grows on a variety of soils and occurs chiefly in mixed forest country.

Seasonal Occurrence: Trouble most often occurs when a light shower of rain or heavy dew falls on lopped branches, particularly when young growth is present on the trees. It is most dangerous after summer rain.

Evidence of Poisoning:

(*a*) Field: This tree is commonly lopped for fodder in drought time. A number of cases have been reported where hungry sheep have died after feeding on loppings.

(*b*) Feeding tests: No feeding tests have been reported.

(*c*) Chemical: The plant contains a cyanogenetic glucoside (a combination of prussic acid and sugar). Monthly tests by the Queensland Agricultural Chemist showed that this was at a maximum in the summer and that young leaves contained more than old leaves.

Plate 7.
BOONAREE.—Twig with leaves and fruit.

Symptoms: Symptoms of boonaree poisoning have not been recorded but most likely they are similar to those produced by other prussic-acid yielding plants such as fuchsia bush (see page 22).

Post Mortem: The condition on post mortem has not been reported but possibly resembles that given on page 22 for fuchsia bush poisoning.

Prevention: It is best not to lop the tree for fodder, but if lopping is necessary, care should be taken to see that hungry sheep do not get large quantities, especially if there is much young growth. The danger of poisoning would be reduced by allowing the cut material to dry off before feeding.

Treatment: Immediately they show signs of poisoning, affected animals should be given the hypo treatment (see page 15).

Fuchsia Bush.

Other Common Names: Native fuchsia.

Botanical Name: *Eremophila maculata* F. Muell.

Description: Densely branched shrub 2-3 ft. high; leaves green, ¾-1½ in. long, tapering at both ends; flowers about 1 in. long, borne singly on slender curved stalks, usually dark red outside except for yellow

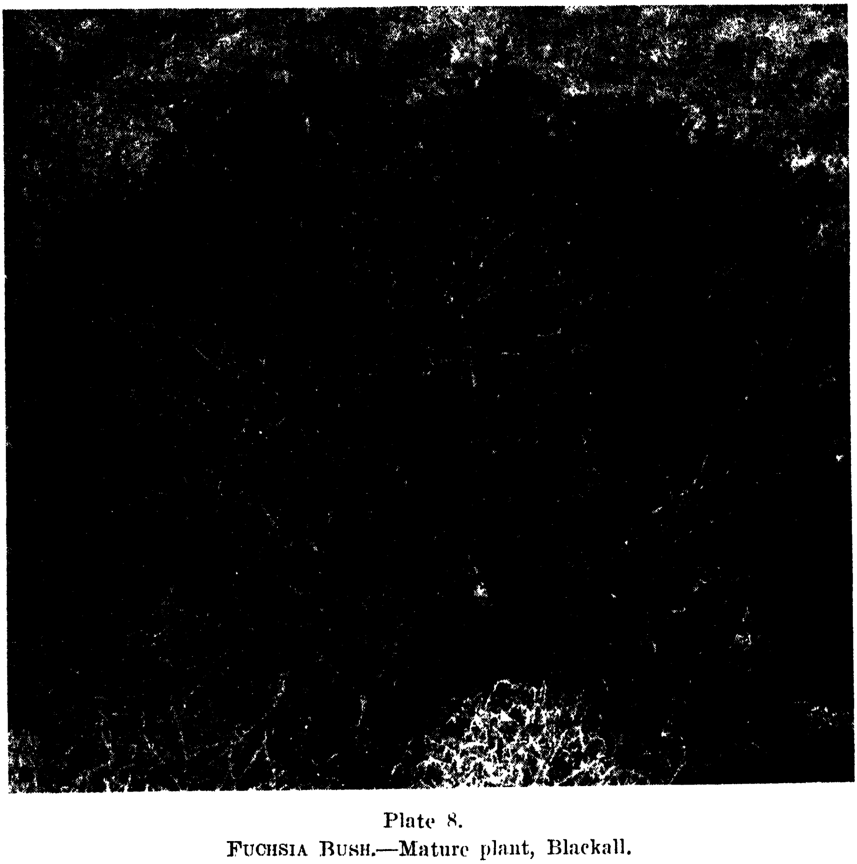


Plate 8.
FUCHSIA BUSH.—Mature plant, Blackall.

shading at the base of the tube, spotted inside and on the drooping lower "petal"; fruits up to 1 in. in diameter, the style persistent like a whisker on the end (Plate 9).

Distribution: In Queensland, the plant ranges widely over the western areas from the southern border to the Gulf. It grows best on the richer soils and often favours the edges of brigalow and gidyea scrubs, though it is not confined to such situations.

Seasonal Occurrence: Fuchsia bush is most dangerous after summer rain but is potentially dangerous at all times.

Evidence of Poisoning:

(*a*) Field: Throughout the sheep-raising districts, the plant has the reputation of being poisonous to travelling sheep. Paddock sheep appear to eat it without ill effect, trouble being experienced only under exceptional circumstances (see page 15).

(*b*) Feeding tests: In 1910, feeding tests in Queensland showed that sheep which ate about half a pound of green leaves died in an hour or less. In feeding tests in New South Wales the plant proved fatal to sheep when enzyme (to liberate the prussic acid from its chemical combination with sugar) was added to the material eaten. Tests without enzyme were inconclusive.

(*c*) Chemical: The plant contains very large quantities of cyanogenetic glucoside. Monthly tests by the Queensland Agricultural Chemist showed a marked fluctuation in the amount of glucoside present.

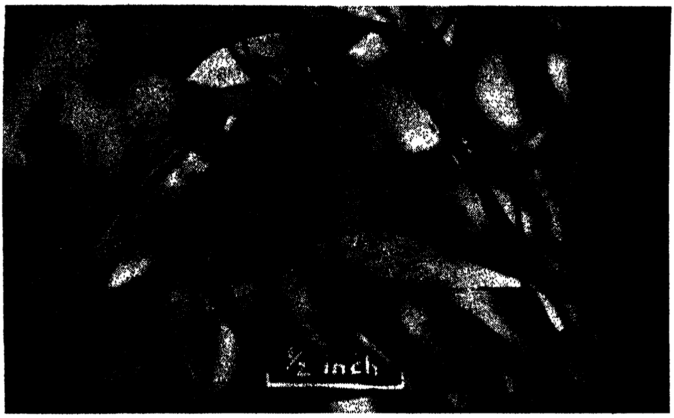


Plate 9.

FUCHSIA BUSH.—Twig with leaves and flowers.

Samples collected after heavy summer rain (January-February) yielded the greatest amount of prussic acid and those collected in a dry October yielded least. The amount of glucoside present appears to depend on the quantity of young leaves in the sample.

Symptoms: Affected animals usually show trembling or twitching of the muscles, accelerated pulse and deep breathing, then fall down. Death usually occurs quickly, often within half an hour.

Post Mortem: Lesions on post mortem are not marked, though there is commonly a little reddening of the paunch.

Prevention: It is well known that paddock sheep eat this plant without ill effect, despite the fact that the plant contains enough glucoside to kill. Apparently in well fed sheep the prussic acid is not released from the glucoside. In hungry animals it is. At the time when the plant is most dangerous (after summer rain) other feed is abundant and it is unlikely that paddock sheep would eat much fuchsia at such a time.

The real danger is with hungry sheep travelling over stock routes with little else but fuchsia bush. The plant is dangerous to such sheep at all times. If possible, travelling sheep should be given hay or a good feed of grass before being driven through big stands of fuchsia.

Treatment: Affected animals should be given the hypo treatment immediately symptoms are noticed. (See page 15.)

Heart-leaf Poison Bush.

Other Common Name: Desert Poison. Although the Queensland plant is not the true heart-leaf poison bush, it is usually known by that name in this State. The true heart-leaf grows only in Western Australia.

Botanical Name: Gastrolobium grandiflorum, F. Muell.

Description: Shrub up to 6 ft. high with several slender stems from a woody tuber just below ground level; leaves opposite, dull bluish-green, 1-2 in. long, ¾-1 in. wide, elliptic in outline, tapered at the base into a short leaf-stalk, often notched at the tip, brittle, leaves on seedlings heart-shaped, hairy; flowers pea-shaped, ¾-1 in. long, petals dark red and very showy; pods small, yellowish-brown, tapered at both ends, hairy, usually containing one seed about the size of a sweet-pea seed.

Distribution: Heart-leaf poison bush grows on yellow sandy soil in poor forest ("desert") country, mainly between Yalleroi and the Newcastle Range. It has been found as far south as Jundah and as far east as Herberton. It occurs also in the Gulf country, the Northern Territory and Western Australia.

Seasonal Occurrence: A conflict of opinion exists as to whether the plant is more poisonous at one season than another. There is no reliable information on this point.

Evidence of Poisoning:

(*a*) Field: Many cases have been reported where heart-leaf poison bush was suspected of killing sheep. Graziers who know it are generally agreed that the plant is poisonous in nearly all stages except, perhaps, when very young, that the leaves are poisonous either green or dry and that all kinds of herbivorous animals are affected except, perhaps, the native marsupials.

Some state that seedlings less than 6 in. high are not poisonous and that they do not become poisonous until the tuber is formed. As yet, this point has not been confirmed. Some vague statements have been made that it is not poisonous at other stages but no definite information is available regarding this.

(*b*) Feeding tests: In tests at Yeerongpilly wethers were killed within 24 hours by as little as ½ lb. of the ground-up leaf.*

(*c*) Chemical: In Western Australia several alkaloids were isolated from allied species but although work is proceeding on the Queensland plant no definite information is yet available.

Symptoms: It has been reported that affected animals showed a very proppy, stiff gait and trembling of the extremities and chin. In most cases animals were found dead.*

Post Mortem: Slight congestion of the lungs, fourth stomach, and small intestines has been observed. In some animals slight congestion was noticed in the liver and kidneys.

* Legg, J.; Minutes of Queensland Poison Plants Committee, 1940.

Plate 10.
HEART-LEAF POISON BUSH.—Mature plant, north of Aramac.

Prevention: "Poison" country is definitely unsafe for grazing until the heart-leaf poison bush has been eradicated. This is usually done by grubbing out the plants, taking care to cut the stems below the tubers. The cut material is allowed to dry, then burnt. As the young seedlings come up, sheep are crowded into the paddock to eat them down. It is important to be sure the young plants *are* seedlings and not suckers from the old roots. Suckers will come up only if the original grubbing has been done badly.

There is a possibility that prolonged heating of the cut leaves will destroy the poisonous principle but this is still not certain. Until definite proof is available, it is better to regard the cut leaves as dangerous.

Plate 11.
HEART-LEAF POISON BUSH.—Seedlings, note hairs on young leaves.

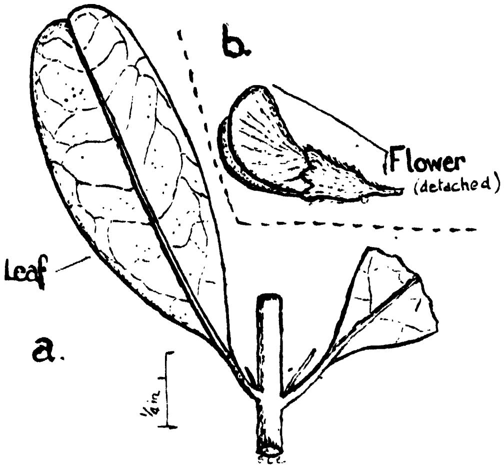


Plate 12.
HEART-LEAF POISON BUSH.—(*a*) Twig showing leaf.
(*b*) Flower (detached).

Treatment: In Western Australia potassium permanganate, or Condy's crystals, was found an effective antidote, the dose for a sheep being 10 grains dissolved in water and administered as a drench. Addition of aluminium sulphate increased the effectiveness of the permanganate solution. So far as is known, the treatment has not been tested in Queensland.

[TO BE CONTINUED.]

MOST DOGS HAVE A REASON FOR BARKING.

"Chubb," Werris Creek, writes:—Years ago, while living on the land, we had several cattle dogs, whose kennels were beside the horse yards and saddle room. One night we had a few friends in to play ping pong. Of course there was quite a deal of laughing going on which we thought was giving the dogs a good reason for all the barking they were doing; therefore no one bothered to go out to the dogs.

Next morning it was easy to see what had caused the barking. When we went to the yard there were two tired sweat-covered horses standing with their heads down, saddles and bridles thrown on the ground. A few days later we discovered that two men who were working on the road nearby had taken our horses and saddles and ridden to a hotel 20 miles away, drank most of the night, and returned putting the weary horses back before dawn.

—*The Land* (Sydney).

PLANT PROTECTION

The Use of D.D.T. on Some Vegetable Crops.

J. HAROLD SMITH, Senior Entomologist.

DURING the past two or three years, the value of the insecticide, D.D.T., for the control of many important insect pests has been demonstrated in Queensland and elsewhere. The killing power of such an insecticide is, of course, only one of many factors which determine whether or no it can be safely used on the farm; the reaction of the crop to commercial preparations containing it, the efficiency of the insecticide when used with other materials and the habits of the insect pest must be considered before existing control practices are modified. New recommendations for the control of an insect pest are normally issued after the completion of both field and laboratory experimental work. Recently, farmer usage has sometimes gone beyond existing recommendations and a statement on the part which D.D.T. may play in pest control work on tomatoes, cucurbits, and beans should illustrate some of the difficulties so far encountered with this insecticide.

Tomatoes.

Tomatoes are grown extensively in all parts of the State and, provided pests and diseases are controlled, the crop yields good returns to the farmer. Considerable sums are therefore spent by farmers each year on the purchase of combined dusts containing both insecticides and fungicides. Such combined dusts lower the labour costs incurred in the application of control measures and are designed primarily to check corn ear worm, tomato mite, and target spot, which respond to lead arsenate, sulphur, and a copper fungicide respectively. In practice, these combined dusts are applied at intervals of seven to fourteen days, depending on the anticipated activity of pests and diseases. When corn ear worm gets out of hand, the farmer either reduces the period between successive applications of the combined dust or inserts a straight lead arsenate dust between successive applications. In short, he doubles up his treatments in order to make sure that lead arsenate is always present on those parts of the plants attacked by corn ear worm.

D.D.T. is, of course, just as, if not more, efficient than lead arsenate for the control of corn ear worm. It has an advantage, too, in that the residues left on the fruit by routine treatment schedules on the growing crop are less hazardous to the consumer. Combined dusts containing D.D.T., copper carbonate and sulphur have consequently been used in some parts of the State. The results, judged by the control of corn ear worm obtained, have not been altogether satisfactory and user-verdict agrees with the results of experimental work to date here. It appears that the efficiency of D.D.T. may be impaired by the copper carbonate in combined dusts, at least in Central and Northern Queensland. The cause of the phenomenon has yet to be determined. However, the field picture is quite clear and tomato growers should, for the time being, consider such dusts as of experimental interest only. Actually, former

control schedules entail no hardship, for lead arsenate has a high level of efficiency for the control of corn ear worm. It is suggested, therefore, that lead arsenate—copper carbonate—sulphur dusts be used on a regular seven to fourteen-day schedule as in the past. If corn ear worm is very active, additional applications of either a 50 per cent. lead arsenate or a 2 per cent. D.D.T. dust may be applied between successive treatments to keep it in check. If both corn ear worm and target spot require special attention, a lead arsenate—copper carbonate dust would, of course, be the extra dust applied in practice.

Cucurbit Crops.

The principal pests of cucurbit crops such as the cucumber, squash, pumpkin and melon, are pumpkin beetles, leaf-eating ladybird, onion thrips and red spider.

Control recommendations for these pests require the use of lead arsenate dusts with or without sulphur and/or nicotine, depending on the presence of red spider and/or thrips respectively. Copper carbonate may be included in lead arsenate dusts applied to those cucurbits which are susceptible to downy mildew. D.D.T. is of interest to farmers as a possible control measure for pumpkin beetles and the leaf-eating ladybird, both of which are readily killed by the insecticide. The first of these two pests is particularly injurious to young plants and at least weekly applications of a lead arsenate dust are often required in the early stages of growth to keep it in check. Such a schedule is exacting and a more efficient insecticide would have much in its favour. Sprays and dusts containing D.D.T. have therefore been used fairly extensively on young crops. Unfortunately, some plants in the cucurbit family are very susceptible to D.D.T. sprays and dusts and injury has been recorded in many districts. This may take the form of necrotic lesions on the foliage and the stem. Sometimes the plants are killed. Perhaps equally serious from the grower's point of view is the fact that, even when no injury is apparent, growth may be temporarily suspended and gradually resumed later after a period of one or two weeks. Such a setback may affect financial returns to the grower, for some cucurbits, such as melons, are grown for specialised markets.

Sprays containing D.D.T. appear to be more injurious than dusts but it seems inadvisable to use either on cucurbit crops until more experimental data are available.

Beans.

The principal pests of edible beans are the bean fly, bean pod caterpillars and bean thrips.

The first of these is by far the most serious and as attacks commonly occur shortly after germination, protective treatments are required. Bean fly was formerly controlled by white oil-nicotine sulphate sprays, but D.D.T. has proved a more effective insecticide. However, the growth rate of the plant, rather than the residual effect of the D.D.T., dictates the period between treatments. Dusts applied at 3-4-4-4 day intervals after the commencement of germination in the field have proved satisfactory, but farmer practice favours a 3-4-3-4 day schedule, as this fits in better with working programmes. Sprays have longer residual effects than dusts and once the plants are well established, a weekly period between treatments is permissible. Working spray schedules

require treatment three days after the commencement of germination, four days later, and at seven-day intervals thereafter. Three spray applications should normally be adequate but a fourth may be needed in late summer and autumn, when the pest is usually very active.

The value of D.D.T. against bean pod caterpillars and bean thrips has not been determined as yet. The insecticide may, however, prove suitable for the control of the former insect as arsenicals cannot be used on fruiting crops.

Other Vegetable Crops.

Many pests attacking other vegetables can be controlled with D.D.T. in dust or spray forms. If treatment is applied when injury is first noted in the crop, outbreaks of leaf eating pests such as the cabbage moth and the brown vegetable weevil may be checked, though additional applications of the insecticide may be needed during the remainder of the growing period. When the pest lives within the plant tissue as in the case of the centre grub of cabbage, treatment may prevent new attacks, but it has little effect on insects already established in the leaves or the stems. Consequently, in districts where these and similar pests are known to be active, it is wise to apply the insecticide regularly during the most vulnerable period in the growth of the plant, i.e., when the plants are young. This may require treatment at fortnightly intervals from germination.

Dust versus Sprays.

It should be noted that sprays containing D.D.T. are generally more effective than dusts provided equal coverage of the plant can be obtained. The superiority of the spray is due largely to the greater persistence of the insecticidal film left on the plant. Both forms of the insecticide are, however, of value to the farmer and his choice will, in practice, be made by the equipment available for applying the material, rather than the relative costs of application.

A BLESSING—AND A WARNING.

Present prosperity is a blessing and a warning, says *"A Rural Policy for Post-War Australia,"* a Commonwealth Government booklet on rural policy. The booklet states:—

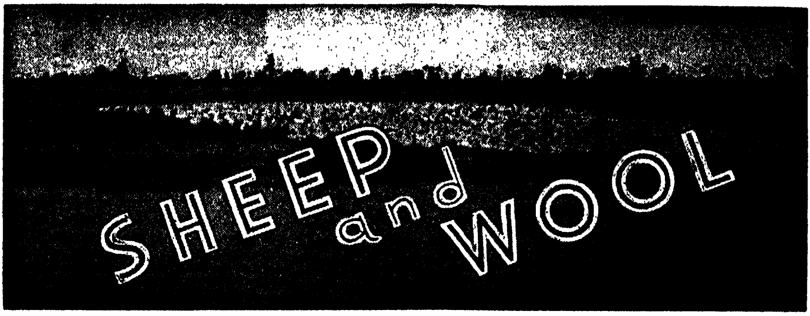
During the war, primary producers, despite shortages of manpower and materials and adverse seasons, have enjoyed more stability of income than previously. On present indications the prosperity of the primary industries will continue for the next few years.

An estimate has been made of expected gross income over the period 1946-1950 which indicates a marked improvement over pre-war years.

This, together with a reduction in farm indebtedness of some 20 per cent. which has taken place during the war, will put farmers in a good position to meet intensified competition in world markets after that period.

The present period of prosperity should be regarded, however, as both a blessing and a warning.

Unless Governments and peoples apply themselves earnestly to the tasks of relating production to the needs of consumers, and unless primary producers themselves do all in their power to assist Governments to achieve this objective through increasing efficiency and by other means, there may well be a repetition after 1950 of the troubles which beset farmers the world over between the wars.



Infectious Labial Dermatitis (Scabby Mouth) of Sheep.

A. K. SUTHERLAND and G. R. MOULE, Veterinary Officers, Division of Animal Industry.

SCABBY mouth is the common name of a disease of sheep which is prevalent in Queensland. The condition is transmitted readily from sheep to sheep and is caused by a minute organism known as a virus.

The economic importance of the disease is that it may cause a transitory check in the development of young sheep.

Distribution and Incidence.

Scabby mouth occurs in all Queensland sheep-raising areas. It is most common in dry seasons when stubble is rough and hard and in seasons when there is a good deal of "red burr" in the pasture.

The disease is seen mainly in young sheep, and one attack confers a solid immunity. Accordingly it is rarely seen in older sheep.

Infective Material.

The virus which causes the disease is present in the scabs which develop during the course of the disease. These scabs drop off the sheep and so contaminate the pasture. In this way the disease spreads, and as the virus in the scab is very resistant to weather conditions infection persists from year to year.

Mode of Infection.

The virus which has contaminated the pasture enters the sheep's skin through small abrasions on the lips and face. Such abrasions are usually caused by eating dry, hard stubble or the prickles of the red-burr or similar plants. The virus can be transmitted to the udder of suckling ewes from the lips of affected lambs. The coronet may be affected when sheep with lesions on the lips bite their feet.

Course of the Disease.

An attack of scabby mouth takes about 14 to 18 days to pass off an affected animal. The disease runs through four typical stages—

(i.) Incubation, which is short—usually 24 to 72 hours;

(ii.) Blister formation, which does not last much longer than 3 to 4 days;

(iii.) Scab formation, which lasts about 8 to 15 days;

(iv.) Healing, which varies in length, but is usually short.

The disease may take 8 weeks or longer to run through a flock, and though many sheep are affected few die.

Plate 13.

TYPICAL CASE OF SCABBY MOUTH IN SCAB FORMATION STAGE.

Symptoms.

In the incubation period there is little to see. During the period of blister formation which follows, small blisters or blebs develop. These are slightly raised, reddened at the base, and filled with a clear watery fluid. The blisters are most commonly seen at the junction of the hairless skin lining the inside of the lip and the hairy skin of the outside.

The blisters develop into hard, dry scabs. These vary in colour from pale yellow to very dark brown and have a characteristic "heaped-up" wart-like appearance. They occur commonly at the angle of the mouth, but may occur also under the chin. Plates 13 and 14 show typical cases of the disease in the scab formation stage.

Secondary infection with other germs sometimes develops, and when this happens the scabs are under-run with pus, which may be creamy-yellow and have an objectionable odour and appearance.

If secondary infection does not occur the lesion is dry. Removal of the scab reveals that the tissue underneath is raw and granulating and may bleed freely.

When the disease has run its course the flesh under the scabs heals and the scabs drop off. The rate at which healing takes place depends upon the presence and the type of bacteria causing the secondary infection, if such is present. After the scabs drop off the animals are no longer infective.

Lambs with sore lips are disinclined to eat, hence they may lose condition.

Plate 14.
SHOWING TYPICAL INFECTIOUS LABIAL DERMATITIS SCABS.

Diagnosis of Scabby Mouth.

The disease is fairly easily recognized by the appearance of the lesions, particularly when many animals are affected.

However, similar lesions may be caused by other agents. Mycotic dermatitis lesions on the face may be confused with scabby mouth.

The former is caused by infection of the skin by a fungus-like micro-organism. It usually occurs on woolled parts of the body, producing "lumpy wool," but infections on the face have been seen. Usually one sees odd cases in a flock.

Diagnosis can be confirmed by sending some of the scabs to one of the Animal Health Stations.

Treatment of Affected Sheep.

Sheep suffering from scabby mouth can be treated effectively by drafting off the affected animals and applying 5 per cent. copper sulphate (bluestone) solution to the lesions. This solution is made by adding ½ lb. of bluestone to 1 gallon of water. Using a swab stick or an old scrubbing brush, the solution is applied forcibly to remove the scabs and let the bluestone get to the raw skin. Sheep treated in this way make a rapid and uneventful recovery.

In some outbreaks it may be advantageous to vaccinate all the sheep in an affected flock as described in the next section.

Vaccination.

Sheep can be effectively immunized against scabby mouth by vaccination. The inoculation of the vaccine is very simple. The immunity produced lasts for at least two and a-half years, and probably for the lifetime of the average sheep.

The best time to vaccinate is at marking time, but sheep of any age can be done. A solid immunity develops about three weeks after vaccination. If a flock of sheep affected with scabby mouth is vaccinated then the outbreak subsides in a few weeks. It is reported also that vaccination accelerates the healing of lesions in affected sheep.

Infectious labial dermatitis vaccine is supplied in two containers, one of powder (virus) and the other of diluting fluid. The powder and the liquid are mixed immediately before they are required for inoculation. The sheep are vaccinated by lightly scratching the skin with a special needle which has been dipped in vaccine. The instrument used for inoculating the vaccine is a darning needle cut through the eye with a pair of pliers to make two points, and then mounted in a special needle holder or in a piece of wood (Plate 15).

To vaccinate the lamb it is held over a rail with the bare skin on the inside of the thigh exposed. The operator dips the needle in the vaccine and makes a light scratch about 1½ to 2 inches long on the bare skin. The needle is again dipped in the vaccine and a second, similar scratch is made parallel to and about ½ inch away from the first scratch. The scratches should be just sufficient to break the top layer of the skin but not deep enough to draw blood. The two prongs of the needle hold a small amount of vaccine which is deposited in the skin as the scratch is made. The needle collects grease and dirt from the sheep's skin, so it should be wiped on a piece of cotton wool after each scratch is made. Several dozen needles should be prepared and sterilized so that a new needle can be used after each batch of 100 sheep is done. Needles are best sterilized by placing them in a bottle and heating in a hot kitchen oven for an hour.

Unfortunately lambs cannot be vaccinated in lamb-marking cradles, because the site of inoculation is not exposed when the lamb is held in the cradle. However, it is quite easy to vaccinate immediately before the lamb is placed in the cradle. The inoculation is so simple that it does not delay the lamb-marking procedure, but one extra man in addition to the usual catching and marking team will be required in most cases to do the vaccinating.

Plate 15.

VACCINATION FOR INFECTIOUS LABIAL DERMATITIS.—Site of vaccination is inside thigh. The sheep is held as for lamb-marking, except that the site is exposed for vaccination.

Scabby mouth lesions develop at the site of inoculation. These appear about 4 days after vaccination as raised red spots, and a few days later most of them have developed into small pustules. Dry scabs are present about three weeks after vaccination, and at four weeks these have usually dropped off and the skin is healed. The lesions produced by vaccination are referred to as "takes." Sheep which are immune to the disease as a result of either natural infection or previous vaccination will not develop "takes." If vaccination does not take in susceptible sheep this may be due to inefficient inoculation or to vaccine of low potency. The aim should be to produce "takes" in all susceptible sheep vaccinated, and to achieve this

instructions regarding handling of vaccine and inoculation should be carefully followed. Susceptible sheep must develop a "take" to develop immunity.

It should be noted that the vaccine contains live scabby mouth virus and therefore must be handled with care. The vaccinator should avoid contaminating human skin or parts of the sheep other than the site of inoculation with the vaccine. The cotton wool on which the needle is wiped and also unused vaccine should be burnt at the end of the day's inocultions.

Plate 16.

SUCCESSFUL INFECTIOUS LABIAL DERMATITIS VACCINATION.—Inside of thigh of sheep showing "take" after vaccination.

A few vaccinated lambs may bite the site of inoculation and so develop lesions on the lips. These are not serious and they heal quickly.

As the scabs which are shed by vaccinated sheep contain scabby mouth virus, the adoption of vaccination could be the means of infecting a property on which the disease had not previously occurred. However, scabby mouth is so widespread that it is very doubtful whether such a property exists in the sheep-raising country of Queensland.

Recommendations on the Use of Vaccination.

The following is a guide to the conditions under which sheep-raisers should vaccinate against scabby mouth:—

1. Fat lambs may suffer a setback as a result of scabby mouth, so on properties where outbreaks have occurred it would be wise to vaccinate the lambs at an early age.

2. If a serious outbreak occurs, the whole flock should be vaccinated; all susceptible sheep would thereby be immunized.

3. On properties where scabby mouth is prevalent, all lambs should be vaccinated at marking time as a routine procedure.

Supply of Scabby Mouth Vaccine.

Vaccine is prepared at the Animal Health Station, Yeerongpilly. The smallest amount of vaccine which it is convenient (for technical reasons) to prepare is 10 c.c. This volume will vaccinate at least 500 and probably 1,000 or more lambs and costs £1 per bottle.

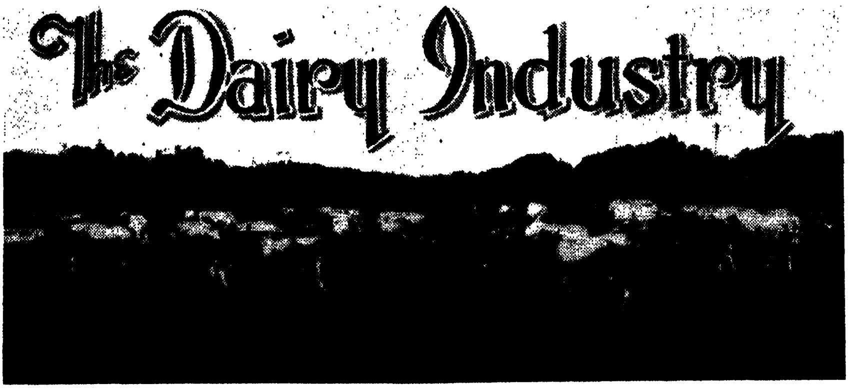
Vaccine will be issued only through field officers of the Department's Division of Animal Industry, so graziers requiring vaccine must order it through their nearest veterinary officer, inspector of stock, or adviser in sheep and wool.

WILL ARTESIAN WELLS RUN DRY?

A recent discussion on the diminishing flow of many bores brought artesian well water again into the top line news. Australia has the world's greatest artesian basin which extends over 590,000 square miles, mostly in Queensland with an overlap into adjoining portions of the Northern Territory, South Australia, and New South Wales. Ever since the first bore tapped the subterranean water-bearing strata there has been speculation as to if or when this great spring would go dry. In Queensland and New South Wales alone, the daily flow of artesian bores is estimated at 293 million gallons, and the duration of this flow has been conjectured from time to time for over the last 50 years.

The first flowing bore in Australia was sunk in 1878 at Kallara Station, on the western side of the Darling River, in New South Wales. That bore is still flowing, though at a reduced rate. However, it was not until nearly 1900 that a real start was made on tapping the vast underground reservoir of artesian water. The development of bore water supplies since then is a fascinating story. Although observations have shown that the flow from the bores is decreasing, the general view is not unduly pessimistic. The most hopeful factor is that, although the flow is diminishing the rate of diminishment is slowing down. Some men of science who have closely studied the question believe that the intake of rain water through the centuries is a permanent replenishment of the artesian reservoir, and that eventually the flow from the artesian basin will ebb to a permanent minimum. It is the extent of this permanent supply that an attempt is being made to determine.

Whether the ultimate flow will be adequate for the needs of the pastoral industry only time will tell. Meanwhile, the theory is that the flow will be satisfactory for another 200 or 300 years. By then, no doubt, surface water conservation shall have reached such a stage that the duration of artesian supplies may not matter so very much.



The Determination of Milk Solids and its Applications.*

L. A. BURGESS, A.A.C.I., Dairy Technologist.

AN accurate chemical analysis is the only infallible method of determining the exact composition of a sample of milk. This is laborious and unsuitable for routine work at milk depots, cheese factories, &c., for whose purposes rapid methods have been evolved which are remarkably accurate for milks of normal character. All such methods lose their accuracy to a certain extent if the milk is abnormal, but in the majority of such cases the results are sufficiently unusual to indicate that an abnormal milk is being dealt with. Such methods include the Babcock and Gerber tests for fat, the formol titration method for casein, and the determination of solids by means of hydrometers. This article deals with the determination of solids in milk and buttermilk by means of hydrometers and methods of applying the results at milk depots, cheese and butter factories.

The first essential is to accurately determine the percentage of fat in the product under examination. This may be done by the Babcock method for milk and the normal butyl alcohol method for buttermilk. These methods have been given in detail in a previous article (1). The other equipment required is specified below.

(1) *Quevenne Lactometer* (see Plate 1).—This is a very sensitive specific gravity hydrometer for milk testing. Lactometers are graduated in ''degrees'' which represent the second and third decimal place of the specific gravity. For example, 32 deg. on lactometer represents a specific gravity of 1·032, 28 deg. represents 1·028, and so on.

Alternatively, a British standard density hydrometer for use in milk, such as is illustrated in Plate 2, may be used. The hydrometers are constructed in two ranges—(*a*) density of 1·025 to 1·035, for use in normal milks; (*b*) density of 1·015 to 1·025, for use in milks of low density and for buttermilks which usually contain a large proportion of added water. They are graduated to indicate density which is slightly different to the specific gravity on which the older Quevenne lactometer degrees are based. It is important that the operator should know which instrument is being used, as the formulæ used to calculate the total milk solids differ slightly for the two instruments.

* Reprinted, after revision, from the *Queensland Agricultural Journal* for September, 1939.

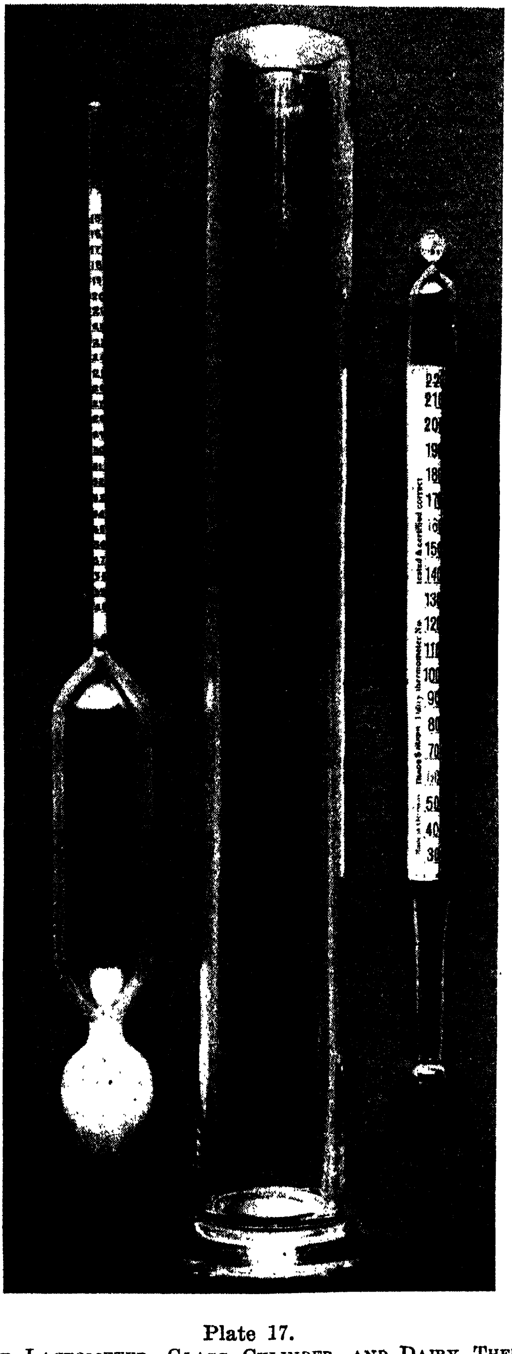


Plate 17.
A QUEVENNE LACTOMETER, GLASS CYLINDER, AND DAIRY THERMOMETER.

(2) *Cylinder* of glass or metal with the top finished off square and without a spout. The diameter should be sufficiently large to enable the lactometer to float freely without touching the sides, and the depth

should be approximately that of the total length of the lactometer. The cylinder should stand firmly without rocking in a true vertical position. A glass cylinder is shown in Plate 1, and the constructional details of a metal cylinder are shown in Plate 3. The dimensions given are for a British standard density hydrometer, size No. 1, and would require modification for other instruments.

(3) *Thermometer.*—If the Quevenne lactometer is used, an ordinary Fahrenheit dairy thermometer will be required. If the density hydrometer is used, a centigrade thermometer is preferable, although not essential.

Making the Readings.

If the milk shows no signs of churning the only precaution to be observed is to adjust the temperature to between 50 deg. F. and 80 deg. F. preferably between 60 deg. F. and 70 deg F. If the milk has been chilled

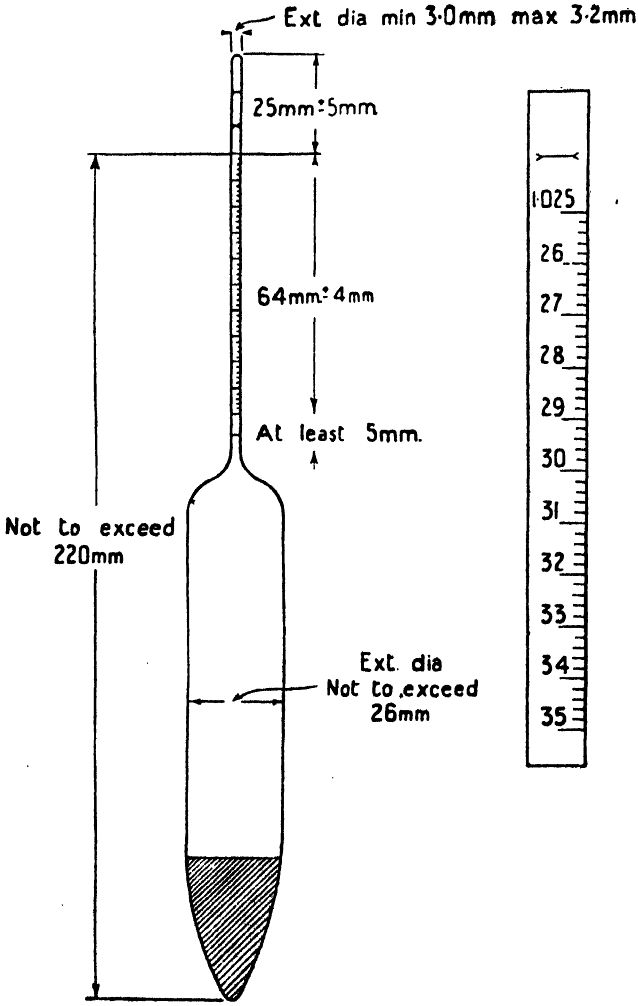


Plate 18.

BRITISH STANDARD DENSITY HYDROMETER FOR USE IN MILK, SIZE NO. 1.—Reproduced by permission from British Standard Specification No. 734—1937.

it is advisable to warm it up to a temperature of about 100 deg. F. and gently but thoroughly mix, then cool to about 70 deg. F. If the fat has been partly churned, it is essential to warm and mix as described. Do not mix so vigorously as to incorporate air bubbles, as this will make the reading incorrect. Sour milk cannot be tested.

Carefully pour the sample of milk into the cylinder so as to prevent the incorporation of air or formation of froth. The cylinder should be nearly filled, so that when the hydrometer is inserted the milk will overflow. Hold the hydrometer by the top of the stem, lower gently into the milk, and release when in its approximate position of equilibrium. The stem above the liquid should not be wetted with the milk for more than ¼ inch, as the weight of the adhering milk will be sufficient to make

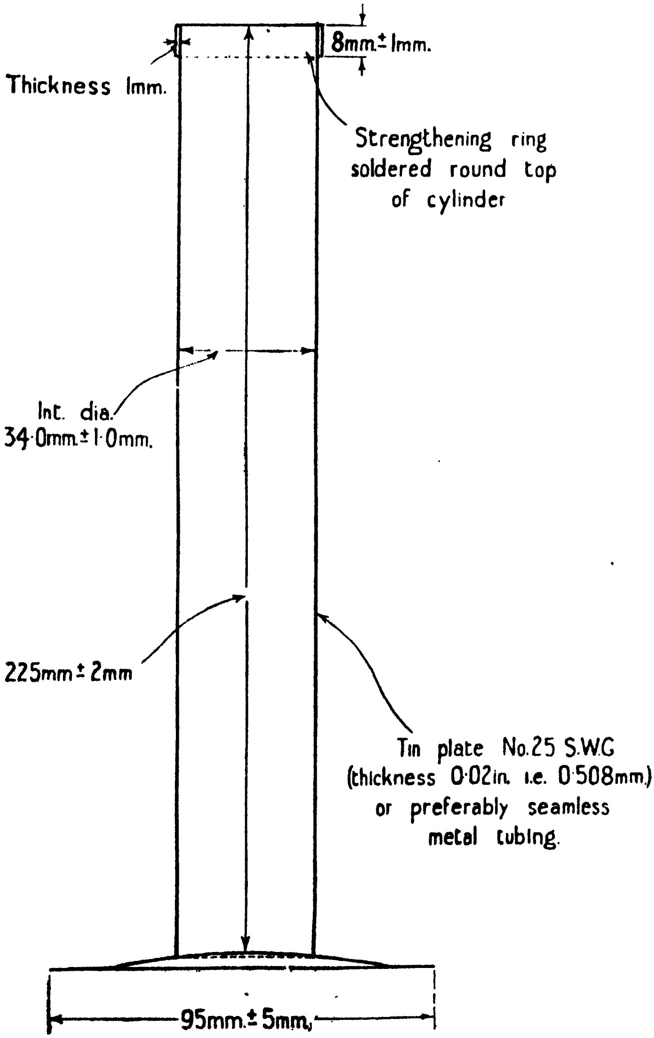


Plate 19.

CONSTRUCTIONAL DETAILS OF A METAL CYLINDER.—Reproduced by permission from British Standard Specification No. 734—1937. The dimensions given are for the British Standard Density Hydrometer, Size No. 1, and would require modifications for other instruments.

the hydrometer sink further into the milk and cause an inaccurate reading. When the hydrometer is at rest the scale reading is taken at the level surface of the milk, not at the top of the milk column around the stem of the hydrometer. To make the methods as uniform as possible the readings of the British standard density hydrometer may be recorded by omitting the digit and moving the decimal point three places to the right; for example, 1·0306 becomes 30·6 and so on. The scale shown in Plate 18 shows that this is easily done. In this way the readings become comparable to the Quevenne lactometer degrees and the calculation of total solids is simplified. For the sake of simplicity they will be called "Density Degrees." Withdraw the hydrometer and immediately introduce a thermometer and record the temperature of the milk.

TABLE I.

Temp. °Fah.	Observed Lactometer Reading.												Temp. °Fah.
	16.	18.	20.	22.	24.	26.	28.	30.	32.	34.	36.	38.	
50	0·7	0·8	0·8	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·3	1·4	50
52	0·6	0·6	0·7	0·7	0·7	0·8	0·8	0·9	0·9	1·0	1·1	1·2	52
54	0·4	0·5	0·5	0·5	0·5	0·6	0·6	0·7	0·7	0·7	0·9	1·0	54
56	0·3	0·3	0·3	0·3	0·4	0·4	0·4	0·4	0·5	0·5	0·6	0·7	56
58	0·1	0·1	0·1	0·1	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·4	58
	Subtract from the observed lactometer reading.												
60	No corrections at this temperature.												60
	Add to the observed lactometer reading.												
62	0·2	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·3	0·3	0·3	62
64	0·4	0·4	0·4	0·4	0·4	0·5	0·5	0·5	0·6	0·6	0·6	0·7	64
66	0·5	0·5	0·6	0·6	0·6	0·7	0·7	0·8	0·9	0·9	1·0	1·0	66
68	0·7	0·7	0·8	0·9	0·9	1·0	1·0	1·1	1·2	1·2	1·2	1·3	68
70	0·9	1·0	1·0	1·0	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	70
72	1·1	1·1	1·2	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·0	72
74	1·3	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·1	2·2	2·3	2·4	74
76	1·6	1·6	1·7	1·8	1·8	1·9	2·0	2·2	2·4	2·5	2·7	2·8	76
78	1·8	1·8	1·9	2·0	2·1	2·2	2·3	2·5	2·7	2·9	3·1	3·2	78
80	2·0	2·1	2·2	2·3	2·3	2·4	2·6	2·8	3·0	3·2	3·4	3·5	80
	16	18	20	22	24	26	28	30	32	34	36	38	

Corrections to be made to the Quevenne Lactometer readings to convert them to readings at 60° Fah.

Corrections for Temperature.

The Quevenne lactometer is graduated to give correct readings at 60 deg. F. If the temperature is not 60 deg. F., a correction must be made to the reading. Table 1 gives the corrections which should be applied at temperatures between 50 deg. F. and 80 deg. F.

The density hydrometer is graduated to give correct readings at 20 deg. C. (68 deg. F.), and Table 2 shows the corrections to be made for different temperatures between 15 deg. C. (59 deg. F.) and 27 deg. C. (81 deg. F.) when the fat ranges from 0 to 10 per cent.

TABLE II.

Temp. °Cent.	Fat Percentage.						Temp. °Fah. (nearest).
	0 Per Cent.	2 Per Cent.	4 Per Cent.	6 Per Cent.	8 Per Cent.	10 Per Cent.	
15	1·0	1·1	1·2	1·3	1·5	1·6	59
16	0·8	0·9	1·0	1·1	1·2	1·3	61
17	0·6	0·7	0·7	0·8	0·9	0·9	63
18	0·4	0·5	0·5	0·5	0·6	0·6	64
19	0·2	0·2	0·3	0·3	0·3	0·3	66
	Subtract from the observed reading.						
20	No corrections at this temperature.						68
	Add to the observed reading.						
21	0·2	0·2	0·3	0·3	0·3	0·3	70
22	0·5	0·5	0·5	0·6	0·6	0·6	72
23	0·7	0·8	0·8	0·8	0·9	0·9	73
24	1·0	1·0	1·1	1·1	1·2	1·2	75
25	1·2	1·3	1·4	1·4	1·5	1·6	77
26	1·5	1·6	1·7	1·7	1·8	1·9	79
27	1·8	1·9	2·0	2·0	2·1	2·2	81
	0 Per cent.	2 Per cent.	4 Per cent.	6 Per cent.	8 Per cent.	10 Per cent.	

Corrections to be made to the British Standard Density Hydrometer readings to convert them to readings at 20° Cent. (68° Fah.).

Calculation of Total Solids and Solids Not Fat.

(*a*) From Quevenne Lactometer Readings:—The lactometer reading at 60 deg. F. and the percentage of fat having been determined, the total solids may be calculated by means of the formula of the noted English dairy chemist, H. Droop Richmond.

Total solids $= \frac{1}{4}$ lactometer deg. $+ 1\frac{1}{5}$ fat $+ 0{\cdot}14$.

Example:—

Fat = 4·2%

Observed lactometer reading = 30·8 at 68° F.

Correction (from Table I.) = Add 1·1

Corrected lactometer reading = 30·8 + 1·1 = 31·9

Total solids = $\frac{1}{4}$ of 31·9 + $1\frac{1}{5}$ times 4·2 + 0·14

$$= \frac{31{\cdot}9}{4} + \frac{6 \times 4{\cdot}2}{5} + 0{\cdot}14$$

$$= 7{\cdot}975 + 5{\cdot}04 + 0{\cdot}14$$

= 13·155. Recorded as 13·2%.

The solids not fat (S.N.F.) would be 13·2 − 4·2 = 9·0%.

(*b*) From Density Hydrometer Readings.—The formula used is based on that of H. Droop Richmond, but is slightly different because of the slight difference between density and specific gravity.

Total solids = $\frac{1}{4}$ density deg. + $1\frac{1}{5}$ fat + 0·7.

[The British Standard Specification No. 734-1937 gives the official formula as:

Total solids = $\frac{1}{4}$ density + 1·21 fat + 0·66.

The modified formula shown in the text gives results sufficiently accurate (from + 0·03 to — 0·08) for all practical purposes.]

Example:—

Fat = 4·0%

Observed density degrees = 30·0 at 20° C. (68° F.)

Correction from Table II. = nil

Corrected density degrees = 30·0

$$\text{Total solids} = \frac{30{\cdot}0}{4} + \frac{6 \times 4{\cdot}0}{5} + 0{\cdot}7$$

$$= 7{\cdot}5 + 4{\cdot}8 + 0{\cdot}7$$

= 13·0%.

The solids not fat in this case is 13·0 − 4·0 = 9·0%.

The figures obtained by the above methods may be applied at milk depots, cheese factories and butter factories for the following purposes:—

1. Detection of Watered Milk.

The legal minimum for total solids is 12 per cent. and for solids not fat is 8·5 per cent. This latter figure is lower than the average which is about 8·8 per cent. The formula given below is based on the average figure of 8·8 per cent., and therefore assumes, quite incorrectly, that all milks containing less than 8·8 per cent. of S.N.F. are adulterated with water. It should be clearly understood that milks which contain less than 8·8 per cent. of solids not fat are not necessarily adulterated, but they may be regarded with suspicion, particularly if the milk is from a herd of Jersey or Guernsey cattle, and to a lesser extent, A.I.S. or Ayrshires. If the S.N.F. are below 8·5 per cent. the milk is of illegal composition in any case and should quite correctly be rejected.

$$\text{Added water} = (8{\cdot}8 - \text{S.N.F.}) \times \frac{100}{8{\cdot}8}$$

Examples:—

(*a*) Fat = 4·2 per cent. Total solids = 13·2 per cent. S.N.F. = 9·0 per cent.

The S.N.F. being above 8·8, the milk is not considered to be adulterated with water.

(*b*) Fat = 3·5%. Total solids 12·0 %. S.N.F. = 8·5%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}5) \times \frac{100}{8{\cdot}8} = 3{\cdot}4\%.$$

This milk may be genuine, but it is equally possible for it to be adulterated with about 3 per cent. of water.

(*c*) Fat = 3·8 %. Total solids = 12·0%. S.N.F = 8·2%.

$$\text{Added water} = (8{\cdot}8 - 8{\cdot}2) \times \frac{100}{8{\cdot}8} = 6{\cdot}8\ \%.$$

In this case it is more than probable that the milk is from a herd yielding milk with a high percentage of fat, and the supplier has added about 7 per cent. of water, but this was not sufficient to reduce the fat or total solids below the legal minima. The added water has, however, reduced the S.N.F. to below the legal minimum. Such milk should be rejected.

2. Detection of Skimming.

Under this heading is included the addition of skimmed or separated milk, as well as the partial removal of fat. Milk fat has a specific gravity of about 0·93 at ordinary temperatures, and the solids not fat have a specific gravity of approximately 1·62. A mixture of the two, therefore, has a specific gravity between these two limits. The removal of fat increases the proportion of the heavier solids not fat, and thereby raises the specific gravity of the total solids. The addition of separated milk has exactly the same effect. The addition of water does not affect the S.G. of the milk solids as the relative proportions of the fat and the solids not fat remain unchanged. When determined by means of the formula given below, the specific gravity of the milk solids of genuine milks containing 3·3 per cent. or more fat usually ranges from 1·30 to 1·33, sometimes a little lower, but never higher than 1·35. If the specific gravity of the milk solids is from 1·34 to 1·35 skimming may be strongly suspected, while if higher than 1·35, skimming or the addition of skimmed milk has undoubtedly taken place. Such milk cannot therefore be regarded as whole milk, but should be regarded as skimmed milk and treated accordingly.

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - (100\ \text{Sp. Gr.} - 100)}$$

Note:—(100 Sp. Gr. — 100) equals $\frac{1}{10}$ of the corrected lactometer reading, and the formula may be more simply stated as—

$$\text{Sp. Gr. of solids} = \frac{\text{Sp. Gr. of milk} \times \text{Total solids}}{\text{Sp. Gr. of milk} \times \text{Total solids} - \frac{1}{10}\ \text{of Lactometer reading.}}$$

Examples—(*a*) A normal milk.

Lactometer reading at 60° F. = 32·0. Fat = 4·0%.

Specific gravity of milk = 1·032

Total solids by previous formula = 12·9%. S.N.F. = 8·9%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}032 \times 12{\cdot}9}{1{\cdot}032 \times 12{\cdot}9 - \frac{1}{10} \times 32{\cdot}0}$$

$$= \frac{13{\cdot}31}{13{\cdot}31 - 3{\cdot}20} = \frac{13{\cdot}31}{10{\cdot}11}$$

$$= 1{\cdot}316$$

(*b*) A partly skimmed milk.

Lactometer reading at 60° F. = 34·0. Fat = 3·3%.
Specific Gravity of milk = 1·034
Total solids = 12·6%. S.N.F. = 9·3%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}034 \times 12{\cdot}6}{1{\cdot}034 \times 12{\cdot}6 - \frac{1}{10} \times 34{\cdot}0} = \frac{13{\cdot}03}{13{\cdot}03 - 3{\cdot}40} = \frac{13{\cdot}03}{9{\cdot}63} = 1{\cdot}353.$$

(*c*) A partly skimmed and watered milk.

Lactometer reading at 60° F. = 31·0. Fat = 3·0%.
Specific gravity of milk = 1·031
Total solids = 11·5%. S.N.F. = 8·5%.
Added water by previous formula = 3·4%.
(Actually this is a very conservative estimate of the added water).

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}031 \times 11{\cdot}5}{1{\cdot}031 \times 11{\cdot}5 - \frac{1}{10} \times 31{\cdot}0} = \frac{11{\cdot}86}{11{\cdot}86 - 3{\cdot}10} = \frac{11{\cdot}86}{8{\cdot}76} = 1{\cdot}353$$

The skimming is shown by the high specific gravity of the solids, and the watering by the low S.N.F. This milk, of course, is also deficient in total solids and fat while the solids not fat are the bare legal minimum.

(*d*) A sample of separated milk.

Lactometer reading at 60° F. = 36·0. Fat = 0·10%.
Specific gravity of milk = 1·0360
Total solids = 9·26%. S.N.F. = 9·16%.

$$\text{Sp. Gr. of solids} = \frac{1{\cdot}036 \times 9{\cdot}26}{1{\cdot}036 \times 9{\cdot}26 - \frac{1}{10} \times 36{\cdot}0} = \frac{9{\cdot}59}{5{\cdot}99} = 1{\cdot}60.$$

3. Determination of Fat Losses in Buttermilk.

A news item entitled "What is a Fair Over-run?" which was distributed to the Press by this Department in April, 1938, contained this statement—"The percentage of the total fat lost is approximately 1 per cent. in the buttermilk. . . ." This has been questioned by more than one factory manager as being an excessively high loss, but actually it is very conservative. It was calculated from the 1934-5 results of about 800 analyses of buttermilks from 37 Queensland factories. It was used along with other conservative losses as a means of demonstrating that the maximum over-run obtainable when all weights and tests are accurate is in the vicinity of 2 per cent. Since these buttermilks were analysed there have been a large number of modern pasteurisers installed which have undoubtedly raised the fat losses above the 1934-5 figures. McDowall (2) quotes fat losses ranging from 0·96 to 1·73 per cent. for a number of New Zealand factories. The quoted loss of 1 per cent. is, therefore, seen to be as low as can be expected with careful factory methods and this loss should be regarded as unavoidable. Carelessness or rush methods, particularly high churning temperatures, and the churning of freshly pasteurised cream, can greatly increase the fat losses.

Methods of determining the fat losses in buttermilk involve the determination of total solids by the methods given previously. The preliminary stages are:—

(1) Collect a sample of buttermilk preferably as it is run from the churn. The sample may, with considerable advantage, be a composite sample from every churning of butter made during the day.

(2) Determine the percentage of fat by the normal butyl alcohol method.

(3) Determine the lactometer reading and temperature.

(4) Make the necessary correction for temperature, and determine the percentage of total solids by the methods already given, then determine the solids not fat.

(5) Determine the percentage of fat in the unwatered buttermilk by means of the formula:—

$$\text{Fat in unwatered buttermilk} = \frac{\text{Fat} \times 8 \cdot 8}{\text{S.N.F.}}$$

Example:—

Fat in composite sample of buttermilk = 0·62%
Lactometer reading at 56° F. = 22·0°
Lactometer reading corrected to 60° F. = 22·0 − 0·3
= 21·7.

Total solids = $\frac{1}{4}$ of 21·7 + $1\frac{1}{5}$ times 0·62 + 0·14 = 6·31%
Solids not fat = 6·31 − 0·62 = 5·7% (to nearest 0·1%)

$$\text{Fat in unwatered buttermilk} = \frac{0 \cdot 62 \times 8 \cdot 8}{5 \cdot 7} = 0 \cdot 96\%.$$

(As an item of interest the percentage of added water may also be determined by the method given previously, and in the above example will be found to be 35 per cent. This water is added in various ways, such as can steamings, water used to standardise the cream to the desired fat percentage, water used to dissolve the neutraliser, rinsings of neutralising and holding vats, steam condensed during pasteurisation with live steam, break water, &c.)

Unwatered buttermilk is really the non-fatty portion of cream as it is received at the factory. The total quantity of cream received is obtainable from the factory books, and, provided the average percentage of fat in this cream is known, the total quantity of unwatered buttermilk received can be found.

Now some of this buttermilk is retained in the butter but the bulk of it is lost. The true fat losses depend upon the proportion of buttermilk which is lost and to determine this it is necessary to know how much is retained in the butter. From many hundreds of analyses of butter, it has been estimated that butter contains 10 per cent. of buttermilk and this figure has been generally accepted as the average for Australian and New Zealand butters. This being so it is an easy matter to determine the true fat losses. The method is as shown in the following example:—

1,000 lb. of cream of 40 per cent. fat contains 400 lb. of fat and 600 lb. of buttermilk. The 400 lb. of fat will make approximately 490 lb. of commercial butter of which 49 lb. is buttermilk. The buttermilk lost is therefore 600 — 49 = 551 lb. The buttermilk contained 0·96 per cent. of fat, therefore the fat lost is $\frac{0 \cdot 96 \times 551}{100}$ = 5·28 lb., i.e., 5·28 lb. of the original 400 lb. of fat.

This amounts to 1·32 per cent. of the fat received in the cream. In the same way the fat losses for any weight of cream containing any percentage of fat can be calculated. Fortunately it is not necessary to follow the whole procedure outlined above as the ratios of buttermilk lost to fat received have been calculated for creams of varying fat content and it is only necessary to multiply the percentage of fat in the undiluted buttermilk by the appropriate ratio. In the above example the ratio is $\frac{551}{400} = 1{\cdot}38$.

The ratios, originally tabulated by a New Zealand worker, Udy, in 1929 for cream of 35 to 45 per cent. of fat have been extended to cover the range 30 to 50 per cent. and these ratios are given in Table III.

TABLE III.

RATIO OF BUTTERMILK LOST TO FAT RECEIVED (AFTER UDY).

Fat Test of Cream.	Ratio.	Fat Test of Cream.	Ratio.
30	2·21	41	1·32
31	2·10	42	1.26
32	2·00	43	1·20
33	1·91	44	1·15
34	1·82	45	1·10
35	1·73	46	1·05
36	1·65	47	1·00
37	1·58	48	0·96
38	1·51	49	0·92
39	1·44	50	0·88
40	1·38		

Example—*continued*.

Fat in unwatered buttermilk = 0·96 per cent.
Average fat test of cream received = 40 per cent.
Udy's ratio for cream of 40 per cent. fat = 1·38 per cent.
Fat lost in the buttermilk = 0·96 x 1·38 = 1·32 per cent.

It is hoped that the methods outlined will enable managers of milk depots and cheese factories to check illegal practices by unscrupulous suppliers. Managers of butter factories should be able to determine the extent of their fat losses in buttermilk and a realisation of their extent should be sufficient to make them realise that other losses require to be kept as low as possible. Possible sources of loss which can be checked are spillage during handling of the cans, waste from the cream samples, leakages, splashing from the coolers, loss of froth, extra butter given away in each box during packing, and most prolific source of loss of all, the extra fat given away by low percentages of water and/or salt in the butter.

REFERENCES.

1. BURGESS, L. A. This journal, 1936. 56, 633-645.
2. McDOWELL, F. H. N.Z. Jour. Sc. and Tech., 1938. 19, 682.

Field Day at Maleny.

TYPICAL of such gatherings, the field day on 18th December on Mr. W. A. Collard's well-equipped dairy farm near Maleny was a notable success. The demonstration was arranged by the district branch of the Queensland Dairymen's Organization, in association with the directorate and management of the Maleny Butter Factory and in co-operation with the Department of Agriculture and Stock. Taking the form of a basket picnic, farmers and their families joined in making it a pleasant social as well as a serious business event. There is no more beautiful and, from a dairying point of view, productive district in Queensland than Maleny, a district obviously imbued with the spirit of progress.

Plate 20.
FARMERS' GATHERING AT A FIELD DAY AT MALENY, BLACKALL RANGE.

Lectures and practical demonstrations were the order of the day. Milking machines and a separator were taken to pieces, so to speak, by Mr. E. Sutherland, Dairy Machinery Adviser, who explained the function of each part and the necessity for its care and effective operation. Dr. Montgomery White, Agricultural Chemist, spoke of the satisfaction derivable from well-reared calves in successful dairying. Adequate pre- and post-natal feeding, he stressed, had an important bearing of future milk production. The veterinary officer present, Mr. A. K. Sutherland, lectured lucidly on the rearing of dairy calves and the treatment of common ailments in young stock.

Mr. P. Daley, Chairman of Directors of the Maleny Co-operative Dairy Association, assisted by the Manager, Mr. J. Ferguson, directed the proceedings. In an interesting address, Mr. Daley summed up the lessons of the day, and, supported by Mr. A. J. Bryce, conveyed a vote of thanks to the visiting advisers, and the appreciation of all present to Mr. and Mrs. Collard for their hospitality and for the use of their fine property.

The value of such farm field days cannot be over-estimated as an effective means of keeping farmers informed of the best methods of installing and operating farm machinery and of the latest developments in the science and practice of agriculture and animal husbandry.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the Herd Books of the A.I.S., Jersey, Ayrshire, and Guernsey Societies, production records for which have been compiled during the month of September, 1946 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD, 350 LB.).				
Alfa Vale Florrie 4th	W. H. Thompson, Nanango	16,773·40	672·164	Penrhos Pansy's Pride
Alfa Vale Model 19th	W. H. Thompson, Nanango	14,386·05	586·617	Penrhos Pansy's Pride
Mountain Camp Thelma 24th	I. B. Skerman, Kaimkillenbun	9,843·49	415·387	Trevor Hill Reflection
Rhodesview Queenie 27th	W. Gierke and Sons, Helidon	8,844·15	414·777	Fairvale Major
Rosenthal Handsome 33rd	D. Robinson, Womina, Warwick	8,124·0	396·695	Rosenthal Perfection
Rocklea Beauty	A. J. Larson, North Bundaberg (196 days)	9,025·0	363·214	Salforn View Baldwin
Jamberoo Mayflower 8th	W. Hinricksen, Clifton	7,244·89	356·854	Greyleigh Valiant
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Glen Idol Prinrose 9th	Estate P. Doherty, Gympie	7,533·7	289·668	Blacklands Banker
Bileena Bonnie 10th	W. F. Hemmings, Murray's Bridge	7,818·2	284·059	Tara Governor
Rhodesview Kitty 25th	W. Gierke and Sons, Helidon	7,005·0	279·464	Fairvale Major
Bileena Choice 3rd	W. F. Hemmings, Murray's Bridge	6,440·15	258·086	Tara Governor
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Glen Idol Florrie 11th	Estate P. Doherty, Gympie	7,601·9	302·364	Blacklands Count
Bunya View Rosette 2nd	J. B. Edwards, Kingaroy	7,102·3	297·727	Bingleigh Royal
Bunya View Susie 2nd	J. B. Edwards, Kingaroy	7,062·05	259·376	Bingleigh Royal
Navillus Shannon 11th	C. O'Sullivan, Ascot, Greenmount	6,096·85	253·058	Greyleigh Eros
AYRSHIRE.				
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Leafmore Lynne Carver	J. P. Ruhle, Motley	8,737·75	295·863	Myola Bessemer
GUERNSEY.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Laureldale Rouge	W. A. K. Cooke, Maleny	5,399·0	317·853	Laureldale Moonboy

JERSEY.

Mature Cow (Standard 350 Lb.).				
Westwood Lilac	F. Porter, Maleny	8,038·95	447·212	Westwood Noble Monarch
Brookland's Primrose	W. S. Conochie, Sherwood	7,556·9	410·913	Brooklands Padishah
Westbrook Sylvia 10th	Farm Home for Boys, Westbrook	7,149·8	384·773	Oxford Aster's Lad
Sunny Glen Mayflower	J. S. McCarthy, Greenmount	7,038·5	362·401	Ivy Bank Marquis
Ashview Hazeleen	C. Huey, Sabine	7,255·0	360·484	Martinvale Duke
Senior, 4 Years (Standard 330 Lb.).				
Elwyn Jessie	E. J. Dunning, Stanmore	7,860·25	450·764	Glenside Lone Star
Junior, 4 Years (Standard 310 Lb.).				
Windsor Lady Deanna	Johnson Bros., Gleneagle	9,417·75	415·643	Brookland Sultan Victory
Westbrook Wyandotte 2nd	Farm Home for Boys, Westbrook	6,746·65	365·353	Orphanage Comet
Senior, 3 Years (Standard 290 Lb.).				
Windsor Princess Madge	Johnson Bros., Gleneagle	8,410·95	453·341	Bobs of Wingate
Wyreene Crystobell	H. T. W. Barker, Oakey	5,813·15	325·776	Wyreene Marcella's Boy
Senior, 2 Years (Standard 250 Lb.).				
Westbrook Pearl 3rd	H. T. W. Barker, Oakey	5,455·6	333·118	Selsey Royal Standard
Westbrook Starbright 4th	Farm Home for Boys, Westbrook	5,651·25	284·224	Selsey Royal Standard
Junior, 2 Years (Standard 230 Lb.).				
Strathdean Fern 2nd	S. H. Caldwell, Bell	6,433·84	400·561	Navua Ladora's Ruler
Strathdean Blossom	S. H. Caldwell, Bell	4,827·24	337·007	Strathdean Observer
Strathdean Model	S. H. Caldwell, Bell	5,282·71	326·287	Oxford King's Victor
Tralee Peerless	W. Muller, Marburg	4,811·95	294·756	Oxford Rivoli
Trecarne Some Tottie	H. T. W. Barker, Oakey	6,044·15	294·145	Trecarne Peer 2nd
Lermond Rosie	J. Schull and Sons, Oakey	5,415·35	282·974	Trinity Noble Effort
Romsey Spotlight	J. Wilton, Killarney	5,799·4	282·383	Oxford Pixie's Victor
Trecarne Safety 5th	H. T. W. Barker, Oakey	5,139·15	281·912	Trecarne Some Duke
Brooklands Angel Cake	W. S. Conochie, Sherwood	5,020·65	268·263	Bulby Maria's Keepsake
Tralee Rosette	W. Muller, Marburg	4,833·00	261·717	Romsey Prince Victor
Trinity Glamour Girl	C. A. Edwards, Alderley	5,506·5	257·586	Trinity Crowning Effort
Junior, 3 Years (Standard 270 Lb.).				
Windsor Princess Irene	Johnson Bros., Gleneagle	7,667·25	416·812	Wingate Bobs

ANIMAL HEALTH

Sodium Fluoride—A New Treatment for Large Roundworms in Pigs.

F. H. S. ROBERTS, Animal Health Station, Yeerongpilly.

SODIUM fluoride is a well-known insecticide, commonly used to control cockroaches and the lice and mites which attack poultry.

Recent work with this chemical in the United States showed that, when administered in the food, it gave very promising results against worms infesting pigs. These results have been confirmed by investigations carried out at the Animal Health Station, Yeerongpilly. At the dose rates recommended here, it has proved more effective against the large roundworm than either oil of chenopodium or phenothiazine. Encouraging results have been secured also against stomach worm, but further work is required before any recommendations can be made regarding its use against this parasite.

Sodium fluoride is cheap; and treatment is simple, as it is given in the food. It may be used either on single pigs or on groups of pigs, and, unlike most of the anthelmintics when employed for group or mass treatment, it loses little of its efficiency when applied in this manner.

Doses.

Commercial sodium fluoride containing 70 to 80 per cent. of pure sodium fluoride is used. The doses are as follows:—

Live Weight of Pig.	Dose of Sodium Fluoride.	No. of Pigs to 1 oz. Sodium Fluoride.
lb.	grams.	
20	2	14
21-40	4	7
41-60	7	4
61-80	9	3
81-100	12	$2\frac{1}{3}$
101-150	15	2
151-200	20	$1\frac{1}{2}$
Over 200	25	$\frac{5}{6}$

Method of Administration.

Pigs may be treated singly or in groups. The method of administration is the same in either case, and is carried out according to the following directions:—

1. Preparation of Pigs.

(*a*) *Weighing.*—The animals are weighed and, if group treatment is preferred, divided according to the weight ranges in the dosage table.

It makes little difference whether two or twenty pigs are treated at the same time, the size of the group being limited only by the trough space, which should be sufficient to avoid overcrowding.

(*b*) *Starvation.*—No food is given on the evening prior to treatment, the animals being treated next morning. Water is permitted freely.

2. Treatment.

(*a*) *Dose of Sodium Fluoride.*—This is computed according to the dosage table and must be weighed accurately.

(*b*) *Preparation of Treated Food.*—Palatable mashes or well ground grains are the only suitable feeds in which to administer the drug. Milk, garbage and whole grain make mixing very difficult and should not be used. The food should have a high calcium content, as this assists in preventing toxic effects. Sufficient food to last the animals for one day must be put out and the computed dose of sodium fluoride thoroughly mixed with it. This step is highly important, for the sodium fluoride must be ingested gradually, otherwise harmful effects may occur and treatment may not be effective.

An amount of food at the rate of 1 lb. of dry feed for every 25 lb. live weight of pig will be found to be adequate. Thus, a group of 10 pigs, 41 to 60 lb. in weight with a total live weight of 500 lb., will require 70 grams or 2½ oz. of sodium fluoride mixed with 20 lb. of dry mash.

With large pigs, such as breeding sows, it is best to divide the medicated food into two equal portions and feed one portion in the morning and the other in the evening.

The treated food may be fed dry or moist. This should be left before the pigs until consumed, and if necessary, a little fresh untreated mash may be added at evening to "sweeten" it.

The treated food is not unpalatable but there may be some difficulty in persuading pigs accustomed to garbage to take a mash. This can readily be overcome by giving no other food until the treated food is eaten, though this may take up to 2 days.

Effect on Worms.

The worms are removed slowly. They may not commence to pass through until the third or fourth day and the action of the drug may not be completed until the eighth or ninth day. The doses recommended here will remove all the large roundworms from most pigs and the majority from the remainder. The drug will remove both mature ond immature worms and is effective against both heavy and light infestations.

Toxicity.

Sodium fluoride, in the doses recommended here, is very safe—safer, probably, than oil of chenopodium or phenothiazine. In a few pigs there may be a little vomiting followed by diarrhoea. These ill effects are very mild and only temporary. Rarely, it may result in acute fluorine poisoning, the symptoms of which are acute trembling with spasms of the limbs and body. Only one case of acute fluorine poisoning occurred in over 300 pigs treated during the investigations at Yeerongpilly.

There is some danger to pigs which are treated several times during their life time, as the fluorine may be deposited in the bones and teeth, causing the bones to become thickened, spongy and brittle, and the teeth to be pitted and easily broken. Fluorosis, as this disease is called, is least likely to occur when the sodium fluoride is fed in a ration high in calcium.

Until further investigations are made, sodium fluoride should not be used more than four or five times in the lifetime of any animal. It is perfectly safe for pigs raised for pork or bacon, when not more than two treatments should be sufficient to keep the worms from being harmful. It should, however, be used cautiously for breeding sows, especially in those cases where treatment is given each time before farrowing.

Warning.

Sodium fluoride, like all anthelmintics, is a poison. Stocks, therefore, should be carefully labelled and locked away when not being used.

Laboratory Examination of Diseased Fowls.

A. K. SUTHERLAND, Animal Health Station, Yeerongpilly.

THE prevention of disease is one of the important factors governing the financial success of poultry farming. Correct diagnosis of the disease affecting a flock is necessary, otherwise the farmer may waste both time and money on curative or preventive measures which are useless.

In the case of many diseases of poultry, laboratory examination of affected birds is necessary to determine the cause of sickness. Poultry farmers are realising this, and the Animal Health Stations at Yeerongpilly and Oonoonba are receiving ever increasing numbers of fowls for examination. This article is a guide to the type of specimen and the information that is required. An unsuitable specimen not only wastes time and labour, but also prevents the owner receiving the full benefit of the examination.

The three main points, viz., the selection of specimens, the despatch of specimens, and information required will be considered in turn.

Selection of Specimens.

This is most important. The essential points are:—(*a*) In most cases live sick birds are better than dead birds.

Soon after the death of a bird or animal, the carcase commences to decompose as a result of invasion of the body tissues by micro-organisms. This process obscures characteristic features of the disease responsible, and renders the body unsuitable for bacteriological examination.

Although live sick birds are preferred, in some diseases death is sudden, and in such cases dead birds have to be sent. These are usually satisfactory if they reach the laboratory within 24 hours of death. Dead birds should be packed in a sound tin or wooden box, and it is desirable, but not essential, that they be wrapped in a cloth soaked in a weak solution of formalin or lysol. This is to keep ants and flies off the carcase. Dead chickens should be packed in a box with dry

wood-wool or sawdust. Live birds are forwarded by rail in a strong crate. Individual organs are seldom satisfactory, and should not be sent if a whole bird is available.

(*b*) The specimen should show symptoms similar to the other cases in the flock.

Quite often specimens are received which are not typical of the main disease affecting the flock. Birds with lowered resistance are liable to contract a number of minor illnesses which, although the harm done may not be very great, obscure the major disease. If in doubt it is advisable to send several birds.

Specimens should be sent as soon as any signs of illness are seen, for, if despatch is delayed, the results and recommendations may be too late to be of any use.

Dispatch of Specimens.

Specimens should be accompanied by the following information:—

(*a*) Sender's name and address.

(*b*) The number of birds forwarded, and the type and age of each bird. When more than one is sent, information identifying each specimen should be included.

(*c*) The crate or package should be properly addressed, and should be despatched by the quickest possible route.

Information Required with Specimens.

This point is very often neglected, and the laboratory worker is left to guess important details which should have been supplied by the farmer. If possible, the Animal Health Station should be advised when to expect the specimens. A covering letter detailing the following points should be sent:—

(*a*) The types of birds in the flock;

(*b*) The number of birds and numbers of different ages;

(*c*) The number of deaths, and at what intervals the deaths have occurred;

(*d*) Percentages of recoveries, if any;

(*e*) Housing conditions;

(*f*) The type and amount of food supplied;

(*g*) The symptoms as seen on the farm. These are important. The following quotation from "Farming in South Africa" gives a good idea of what is required in this respect:—

"Do not try to interpret symptoms. E.g., instead of saying that the fowl had diarrhoea, say the droppings were very watery and yellowish green, and smelt badly; instead of saying the fowl was blind, say the lids were stuck together over the eye, or that over a period of months the reddish-brown part of the eye had gradually turned grey till the fowl could no longer see out of that eye. A simple, straightforward account of the symptoms does not include a farmer's thoughts and deductions, but only a plain description of what he has ascertained by using only his eyes, nose, ears, and hands."

If the above points are observed, the laboratory can make a satisfactory diagnosis and recommend steps to be taken in the control and prevention of the disease.

GENERAL NOTES

Seasonal Greetings Acknowledged.

Seasonal greetings, all of which are cordially reciprocated, have been received from:—

The Hon. H. H. Collins, M.L.A.; the Hon. T. L. Williams, M.L.A.; the Hon. T. A. Foley, M.L.A. and Mrs. Foley; the Under Secretary and Staff of the Western Australia Department of Agriculture; the Governor and Deputy Governor of the Commonwealth Bank of Australia; the President of the United Graziers' Association of Queensland (Mr. P. B. Newcomen); the Missionaries of the Divine Word, St. Vincent's Missionary Seminary, Marburg, Queensland; Brisbane Legacy; the Chairman and Members of the R.S.L. War Veterans' Home Committee; the Members of the Executive Committee of the Council of Agriculture; the Officers and Members of the Ipswich Workshops Educational Association; the Deputy Director of the Ministry of Post War Reconstruction (Mr. E. F. Router); the Commissioner and Staff of the State Government Insurance Office; Winchcombe Carson, Limited; Myers and Co. Proprietary, Limited; Taubmans Proprietary, Limited; Thermax Water Heaters Proprietary, Limited; *The Monto Herald;* Falkiner Machinery Company, Limited; W. C. Haigh, Ipswich; International Harvester of Australia, Limited; the Co-ordinator-General of Public Works (Mr. J. R. Kemp); the Farmers' Centre, Dalby.

Staff Changes and Appointments.

Mr. N. E. H. Caldwell, M.Agr.Sc., Entomologist, has been appointed Horticulturist, Division I., Horticulture Branch, Department of Agriculture and Stock.

Messrs. J. M. Harvey, M.Sc., and H. L. Wood, M.Sc. (Adelaide), A.A.C.I., Analysts in the Agricultural Chemical Laboratory, have been appointed Chemists, Division II., Chemical Laboratory, Division of Plant Industry, Department of Agriculture and Stock.

Mr. C. M. Goy, Clerk of Petty Sessions, Sarina, who has been seconded for duty as Acting Private Secretary to the Minister for Agriculture and Stock, has been appointed Private Secretary to the Minister.

Mr. H. G. Moon, Dip. Pub. Admin. (Bardwood Park, N.S.W.), has been appointed Marketing Reporter, Marketing Division, Department of Agriculture and Stock.

The Pest Destroyers Board.

The Pest Destroyers Board, constituted under *The Pest Destroyers Act of* 1939, has been reconstituted for a period of two years from 14th December, 1946. In addition to the Agricultural Chemist, Dr. M. White, and the Registrar, Mr. F. B. Coleman, the following have been appointed:—Dr. F. H. S. Roberts (Entomologist, Veterinary), Dr. J. Legg (Pathologist, Veterinary), Messrs. J. H. Smith, (Entomologist, Plants) and J. H. Simmonds (Pathologist, Plants).

The Veterinary Medicines Board.

The Veterinary Medicines Board constituted under *The Veterinary Medicines Acts,* 1933 to 1938, has been reappointed for a period of two years from 14th December, 1946. In addition to the Agricultural Chemist and the Chief Inspector of Stock, Drs. F. H. S. Roberts and J. Legg are the Bacteriologist and Veterinary Surgeon, respectively, on the Board.

Honey Board.

Notice of Intention to extend the operations of the Honey Board for a further period from 9th March, 1947, to 8th March, 1950, is contained in an Order in Council issued under *The Primary Producers' Organiastion and Marketing Acts.*

Fertilizer Rationing.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has announced that the fertilizer supply position in Queensland is at present so satisfactory that it appears that no useful purpose can be served by a continuation of the present system of rationing of fertilizers. Therefore, as from the 1st January, 1947, the sale of fertilizers within the State of Queensland will not be subject to control other than as follows:—While the State supplies are subject to a quota system, or are in limited supply, it will be necessary to continue allocations to the manufacturers, who are charged with the responsibility of apportioning their supplies in such a manner as to ensure that their clients' needs are satisfied. All abnormal orders received are to be referred to the Standards Branch of the Department of Agriculture and Stock for attention.

First priority of delivery must be granted in respect of any permits to purchase fertilizer which may be issued by the Department of Agriculture and Stock. The Minister added, however, that in the event of circumstances warranting it, the Department might again have recourse to rationing of fertilizers either in whole or in part.

In Memoriam.

SYDNEY SMITH HOOPER.

THE death of Mr. S. S. Hooper, formerly Chief Accountant of the Department of Agriculture and Stock, which occurred on Saturday, 23rd November, 1946, is recorded with deep regret.

Plate 21.
Mr. S. S. Hooper.

The late Mr. Hooper entered the Public Service as a clerical assistant in 1886, and became accountant of the Department of Agriculture in 1894. For more than forty years he framed the annual estimates of the Department, and the method evolved by him was adopted subsequently by other Government departments. Every year he attended sittings of Parliament to assist his Minister in the presentation of departmental estimates, and was accorded the unusual distinction of oft-repeated references in the Assembly to the value of his work. He was noted for his successful financial administration. Many juniors whom he trained afterwards achieved high distinction in the accountancy and legal professions.

On the occasion of his retirement in June, 1936, after forty-two years service to the State, high tributes were paid in Parliament by leaders on both sides of the House to his integrity, zeal and capacity as a public officer. A former Premier, Hon. W. Forgan Smith, LL.D., said of him that "he was a capable and loyal officer whose services I appreciated to the full." The Minister for Agriculture and Stock at the time, Hon. Frank W. Bulcock, spoke of Mr. Hooper as a man of great capacity and strong and enduring purpose who had rendered invaluable service to Queensland during his long and distinguished career. He had been more than a staff officer to the fifteen Ministers under whom he had served, and "was that rare type of public officer who was not only a Minister's accountant, but also his guide and friend." He retired from the Public Service with the knowledge that he possessed the confidence of everyone with whom he had been associated, as well as the high esteem and deep and abiding affection of his colleagues.

During the war years, Mr. Hooper patriotically rejoined the Department temporarily to assist in easing the situation caused by the absence of many officers on active service with the Armed Forces. When informed of his death, members of the Legislative Assembly referred sympathetically to the passing of a man who had established high standards in public administration, and who otherwise had served nobly his day and generation.

Rural Topics

More Wool, More Work.

Speaking on "Wool and What It Means to Australia" at the annual conference of the Countrywomen's Association of South Australia in Adelaide, Miss G. MacKinnon, Secretary of the Australian Wool Board, said that a recently published graph showed the direct relationship between the value of the Australian wool clip and the number of persons gainfully employed. It emphasised that as the value of the clip rose, so the prosperity of our working population increased.

Miss MacKinnon said the high prices realised at the recent wool auctions had had the effect of giving buoyancy to the whole economic outlook. It was the first real fillip given to Australia's economy since the war ended.

The reason was, of course, that wool was the most important single industry in this country, representing about 12 per cent. of the total value of all Australian production and 40 per cent. of the gross value of our exports.

To-day wool was one of the bulwarks of Britain and the Empire, just as centuries ago it made for England's economic strength.

In Elizabeth's reign it was decreed, in order to increase the use of wool, that everyone over the age of seven must wear a wool cap when out of doors. And in Charles II.'s reign a law was passed requiring that the dead should be buried in a wool shroud.

A show of hands was called for on the question as to whether those present would wear lightweight wool stockings if they were available; almost everyone of the 250 present signified that they would.

Care in Handling Poultry.

On the farm, in the market, at poultry exhibitions or shows, or during transit, it is inexcusable to handle poultry roughly. Even carrying them by the legs or wings is objectionable, and may cause injury. To catch fowls in the laying house place a wooden framework covered with wire-netting, about 6 ft. high, across one corner of the house. Carefully drive the birds behind this partition where a helper located behind the framework may catch the birds quietly. An opening in the framework, about 3 ft. from the ground and extending to the top, will enable the helper to pass the birds through. A bag nailed at the top and allowed to hang down over the opening will prevent the birds from escaping.

When crating for market, fowls should be given sufficient room in the crate. If overcrowded, the birds may be injured or die in transit. When the distance to market is great, the birds should be fed and given a drink just before they are despatched. For turkeys, straw should be placed in the crate to avoid damage to the breasts, and the different sexes should be placed in separate crates. If a small lot is placed in one crate, the males and females should be separated with a division. Various sizes and kinds of poultry should always be separated.

The practice of dropping crates of poultry heavily on the ground during loading and unloading, or handling poultry roughly as they are being moved in or out of transport crates, is most detrimental to the birds, apart from its cruelty.

How Julia Creek was Named.

A little-known historical fact is the story relating to the naming of Julia Creek. Robert O'Hara Burke, who, with Wills, opened up this part of the country, was a romantically minded Irishman, and named the creek after the beautiful Julia Matthews, musical comedy star of those days. It is said that the ill-fated Wills was an aspirant to the affections of the actress, and because of her unsympathetic attitude towards his advances he went on the expedition with Burke. Incidentally, Julia Matthews later went to New Zealand and the U.S.A. and in both countries was a success. She died in Missouri.—"*The Professional Officer* (Q.)."

The Queensland Year Book, 1945.

The Government Statistician has published the sixth issue of the Queensland Year Book. This is the first issue since 1941, after which publication was suspended because of war conditions.

Some sections have been re-written and amplified to keep the Year Book up to date; included in the more important sections of the new material are:—Maps showing normal summer and winter rainfall. The progress of artesian bores, and a summary of a report by a special committee appointed to investigate the diminution of bore flows. Live stock classified according to type; artificial fertilizers used on crops and pastures; and machinery used on rural holdings. Results from Queensland Family Expenditure Enquiry made in 1939-40. Average requirement of nutrients and consumption in Queensland and other countries. Uniform Taxation and its application to Queensland.

Some interesting items selected from this publication are:—

Population.—The population of Queensland at 31st December, 1944, was 1,071,441. The proportion living in the City of Brisbane was 35.9 per cent. Since 1939 Brisbane's population has increased by 16.4 per cent.

Social Services.—Primary and Secondary Schools at the end of 1944 numbered 1,765 and had a net enrolment of 170,210 during 1944. The 116 public hospitals treated 118,055 general patients and 16,752 maternity patients during 1943-44. The number of maternity allowance claims paid in 1943-44 was 23,743, and at 30th June, 1944, there were 148,021 children in Queensland for whom Child Endowment was being paid.

Production.—The net value of production in 1943-44 was £57 million in primary industry and £30 million in secondary industry.

Manufacturing.—The value of all goods and services produced by Queensland's 2,588 factories in 1943-44 was worth £88 million, including Meatworks £15 million, Butter and Cheese Factories £12 million, Sugar Mills £10 million, and Vehicle and Metal Industries £18 million.

Transport.—There were 125,138 Motor Vehicles registered at 30th June, 1944, of which 67,188 were private cars, and 50,290 trucks. There were 2,516 serious traffic accidents reported in which 230 persons were killed and 3,188 injured.

Trade.—Imports for 1943-44 amounted to £45 million. (Oversea £16 million and Interstate £29 million) and exports were £37½ million. (Oversea £18 million, and Interstate £19½ million.)

Public Finance.—The Queensland Government received £8,783,000 (including £5,821,000 reimbursement of income taxation) from taxation in 1943-44 and received £2,254,000 from land revenue. The net public debt at 30th June, 1944, was £127,334,000.

Private Finance.—Deposits at cheque-paying banks at 30th June, 1944, totalled £117,184,000, and at Savings Banks £80,094,000. Average weekly bank clearings rose from £4¾ million in 1939 to £7 million in 1944. There were 575,000 life assurance policies in force at the end of 1943 with a sum assured of over £97 million.

Rust-Resistant Wheat Saved U.S.A. Millions.

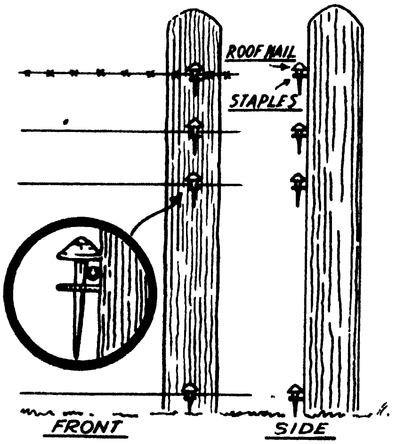
Son of a farmer in the boulder-strewn Coteau Hills of South Dakota, U.S.A., a modest little man known personally to very few, Edgar McFadden, is claimed to have saved United States wheat farmers more than 400,000,000 dollars during the war years by producing a rust-resistant wheat.

In the dread rust year of 1904 when Edgar was just a 13-year-old lad, he noticed that a stock feed wheat grown on his father's farm, was not bothered by rust. This was Yaroslav emmer. Later, in college, Edgar asked laboratory scientists whether the worthless emmer, crossed with Marquis, might not produce a rust-resistant type. The answer was no. But the lad persevered, even though Marquis flowered early and emmer late. On the one overlapping day, 4th July, 1917, the lad toiled over his wheat mating, but the results of his labour produced only one green sprout. This single seed produced 100 shrivelled kernels, which, though rust resistant, were subject to stem rot. For six years McFadden stuck to his self-appointed task, mortgaging his farm, raising money on his insurance policy, and eventually producing Hope, resistant to stem rot, leaf rust, and five other diseases. Thus spurred by success, he went on to produce Rival, Pilot, Mida, Austin, and Cadet since the war started. More than 1,000,000 acres of Austin were planted in Texas on land which had never previously been able to produce wheat.

For all the millions of dollars that he has put into the pockets of U.S.A. farmers, Edgar McFadden has profited not a penny. He lives modestly in Texas to-day, still fighting man's bloodless battle for bread.—*The Land* (Sydney).

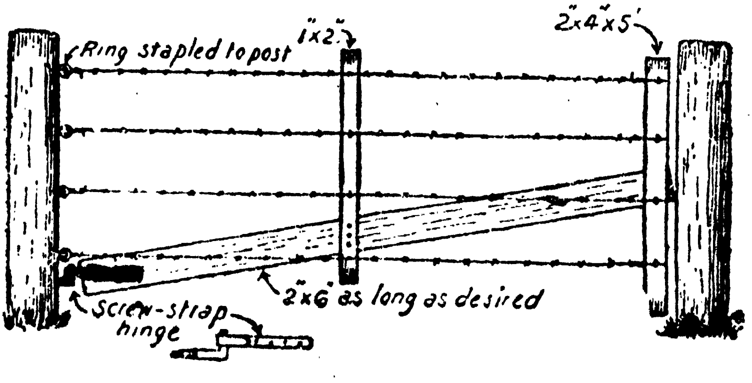
GADGETS AND WRINKLES

"LIGHTNING" FENCE.



Here is a useful idea for a temporary fence. Staples can be driven into stakes or posts, the wire (or netting) is pressed against the uprights and a roofing nail dropped through the staples as illustrated.

AN IMPROVED WIRE GATE.



An improvement on the ordinary "concertina" type of wire gate.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

THE CHILD WHO IS UNDERWEIGHT.

THE loving eye of father or mother often overlooks the absence of some or many of the points that go to make for good health and is satisfied if the child has only a few good health marks to his credit. For this reason, the parents who have their children's welfare at heart will wisely take them to their family doctor or, if they live in the metropolitan area, to one of the Toddlers Health Centres for regular weighing and health examination.

A growing child needs the correct body weight to match his height; he needs some fat stored under the skin. This improves his appearance and helps to keep him warm. It is surprising how a thin girl or boy improves in looks when a few extra pounds are added to the weight. The average gain of a school child is about half a pound a month. The underweight child should gain more than the normal child in order to reach the average weight for his age and height.

Something is wrong with a child who does not gain or who shows a steady loss of weight in spite of what may seem to be proper care and a thorough medical examination is called for in this case. Children who, though not ill, are much below weight for their height usually fall into two main types:—

(1) The over-energetic type, keyed up, excitable, too active and often difficult to manage. These children often have good muscular development, but practically no fat under the skin.

(2) The mentally dull, listless type, lacking in energy and ambition, easily fatigued and with poorly-developed muscles and flabby tissues.

School surveys have shown that underweight is not confined to the children of poorer parents. A surprisingly large number of children in well-to-do families also are undernourished.

No underweight child should be admitted even to a Kindergarten School until every effort has been made to bring him up to normal weight. When the underweight child is not given care during the pre-school period, the demands of school life make it harder for him to regain his weight, and he may remain stunted throughout his life.

Health Rules for the Underweight Child.

After the doctor has advised regarding any physical defects, arrange that the following routine is followed as closely as possible:—

1. Three meals a day—eaten slowly. These should be taken from the important articles of food: milk, whole grain cereals and bread, meat, fish, eggs, vegetables, and fruit. A drink of milk and a piece of fruit may be given between meals. No sweets.

2. The bowels should be kept open.

3. Rest periods in a quiet room with the windows open one hour in the morning and half an hour in the afternoon. Ten to twelve hours sleep at night according to age.

4. No hard exercise until the weight is normal, but plenty of playtime out of doors.

5. No nervous excitement—very few parties or movies or picnics until the weight is normal. Motor trips should be avoided. Learning a handicraft may be helpful to the nervous, highly-strung child.

6. If the child has already started school, outside extra classes and homework should be omitted or very much reduced. The doctor may advise complete absence from school for a time.

Any further advice re this or any other matter can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters, *Baby Clinic, Brisbane*; these letters need not be stamped.

IN THE FARM KITCHEN.

Bran and Raisin Bread.

Take 1¼ cups each bran, wholemeal, and white flour, ½ cup of honey, chopped raisins, and crushed nuts, 2 teaspoons baking powder, 1 teaspoon salt, 1 egg, 2 tablespoons sugar, 1½ cups milk. Mix dry ingredients together, add raisins and nuts, moisten with milk, beaten egg, and honey. Beat well and bake one hour in a moderate oven.

Wholemeal Bread.

Three cups wholemeal, 2½ teaspoons baking powder, ½ teaspoon baking soda, ¾ teaspoon salt, 1 tablespoon golden syrup, 2 teaspoons raw sugar, 1 cup milk. Mix the dry ingredients together and stir in the golden syrup and milk. Add a little more milk if the mixture seems too stiff. Bake in a large tin for one hour. This mixture is sufficient to fill three baking powder tins, which require only 35 minutes baking time.

Buttermilk Raisin Bread.

Four cups flour (wholemeal or half wholemeal and half white), ½ cup sugar, 1 teaspoon salt, 1 teaspoon bicarbonate soda, 1 teaspoon baking powder, 2 cups freshly-churned buttermilk, ½ cup chopped nuts, 1 cup raisins. Sift the flour once, add sugar, salt, soda, and baking powder and sift again. Add buttermilk and beat well. Lastly, add nuts and raisins and bake about three-quarters of an hour in loaf tin.

Peanut Butter Bread.

Two cups enriched flour, 1-3 cup sugar, 2 teaspoons baking powder, 1 teaspoon salt, ¾ cup peanut butter, 1 egg well beaten, 1 cup milk (scant). Sift together flour, sugar, baking powder and salt. Work into this, with fork, peanut butter and egg. Add milk. Put into buttered pan and bake 50 to 60 minutes in moderate oven (350 deg. F.). This makes one loaf.

QUEENSLAND WEATHER IN DECEMBER.

Rainfall distribution was again below normal in most divisions. Following on the relatively poor distribution of seasonal local inland thunderstorms during October and November, the rainfall in December was very little better and mostly patchy and variable. The only divisions showing over-average aggregate rains were the Peninsula South 733 points (average 605), the Upper Western 191 points (average 184), and the Maranoa 283 points (average 258). Parts of the Upper West about the Plateau were relatively fortunate for western areas in receiving rain on three occasions, 6th, 20th, 25th-27th, the last period being associated with an inflow of moist, tropical air which improved the figures for the Peninsula, Carpentaria, and some districts to the west of Townsville. The above-average figures for the Southern Peninsula were also chiefly a result of this tropical inflow. The Maranoa Division received chiefly light to moderate falls in the first week and from 11th to 16th; the district totals were mainly increased by local falls of two to two and a half inches in the Yuleba-Surat areas on the 19th. Below-average totals, yet better than most other divisions, were recorded in the Upper Carpentaria, Central Highlands, and Darling Downs Divisions. Several divisions—Peninsula North, Lower Carpentaria, South Coast, and Warrego—showed district aggregates of approximately 35 to 40 per cent. below normal. All other divisions of the State were over 50 per cent. down on average rainfall aggregates for the month, the lowest being Central Lowlands (— 68 per cent.), North Coast Herbert and Central Coast East (— 66 per cent.). An examination of individual station recordings shows that in addition to the districts abovementioned with December aggregates above average, there were also some scattered over-average totals in Southern Carpentaria, Central Highlands, Downs, and South Coast, but it is evident that a good seasonal rain distribution is needed over most of the State to offset the many consistent deficiencies since April, 1946.

Pressure.—During the month there was no marked development of systems needed for the production of general rain. Monsoonal influences became evident in the far North from 26th onwards and a tropical depression developed off the North Coast on 30th, ultimately deepening to a cyclonic centre moving south-eastwards from Willis Island on the 1st January, 1947. The development of this cyclone was not at the time assisted by south-easterly flow from a southern "high" and its rain influence in December deteriorated accordingly. Indicative of the persistence of the high pressure ridge over the Queensland east coast, the only period when south-easterlies rached the Gulf Country was 7th to 10th. A dip formation, Carpentaria to South-east Queensland, which developed into a shallow "low" moving across North-east New South Wales to seaward by the 4th, gave fairly general thunderstorm rains in Central Highlands, Downs, and South Coast.

High Winds.—A violent thunderstorm occurred at Brisbane on the late afternoon of the 3rd, with hail damage and a maximum gust from the S.S.E. of 79 miles per hour which was the highest on record for the city. Another severe storm recorded S.W. 89 miles per hour at Archerfield on the 15th (and 65 m.p.h. at the bureau). There were local severe blows in the northern Downs and Central Highlands on the 12th, particularly in the Ilfracombe district, rail and bridge damage resulting.

Temperatures.—Average maximum and minimum temperature readings over the State were mostly higher than normal. The highest daily maximum reading of 111 deg. was recorded at Boulia on the 13th. Temperatures of over 100 deg. were reported on 23 days at Winton, 20 days at Windorah and 18 days at Boulia and Longreach. Winton had 11 consecutive recordings over the century from 10th to 20th, and 14 out of the high temperatures there topped 105 deg. with a maximum of 109 deg. on the 18th.

Brisbane.—Mean pressure $\frac{9+3}{2}$ 29.872 inches (normal 29.889). Temperature, mean maximum 85.7 deg. (normal 84.7 deg.); mean minimum, 69.4 deg. (normal 67.4 deg.), highest since 70.7 deg. in 1923 and the third highest on record; mean temperature, 77.5 deg. (normal 76.1 deg.). Highest daily temperature 99 deg. on 30th, lowest daily temperature 62.8 deg. on 4th.

Rainfall.—611 points on 9 days (average 505 points on 12 days) (The severe thunderstorm of the 3rd, record wind gust of 79 m.p.h. from the S.S.E. gave 278 points of this total). Sunshine, 263 hours (normal 253) giving mean daily of 8.5 hours (normal 8.3).

The rainfall position is summarised below:—

Division.	Normal Mean.	Mean Dec. 1946.	Departure from Normal.	Progressive Totals, May to end of December.	
				Normal.	1946.
	Points.	Points.	Per cent.	Points.	Points.
Peninsula North	702	446	36 below	1216	924
Peninsula South	605	733	21 above	1045	759
Lower Carpentaria	392	261	33 below	728	337
Upper Carpentaria	377	327	13 ,,	850	465
North Coast Barron	690	298	57 ,,	1946	795
North Coast Herbert	690	237	66 ,,	2441	679
Central Coast East	454	153	66 ,,	1447	443
Central Coast West	333	137	59 ,,	967	359
Central Highlands	316	228	28 ,,	1270	556
Central Lowlands	221	70	68 ,,	866	216
Upper Western	184	191	4 above	553	279
Lower Western	137	53	61 below	566	88
South Coast Port Curtis	455	277	39 ,,	1826	908
South Coast Moreton	509	320	37 ,,	2388	1129
Darling Downs East	351	320	9 ,,	1669	1147
Darling Downs West	277	197	28 ,,	1309	716
Maranoa	258	283	10 above	1281	548
Warrego	215	131	39 below	988	288
Far South-west	155	75	51 ,,	722	115

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

FEBRUARY.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.21	6.42	Cairns	41	17	Longreach	40	30
6	5.24	6.40	Charleville ..	29	25	Quilpie	34	36
11	5.28	6.36	Cloncurry	57	42	Rockhampton ..	15	5
16	5.32	6.32	Cunnamulla ..	28	30	Roma	18	16
21	5.35	6.28	Dirranbandi ..	18	20	Townsville ..	34	16
26	5.38	6.23	Emerald	24	14	Winton	46	34
28	5.40	6.21	Hughenden ..	42	27	Warwick	3	5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	2.28	12.23
2	3.36	1.13
3	4.43	2.10
4	5.44	3.14
5	6.39	4.22
6	7.26	5.32
7	8.07	6.40
8	8.43	7.45
9	9.17	8.46
10	9.49	9.44
11	10.21	10.41
12	10.55	11.37
		p.m.
13	11.31	12.32
14	..	1.27
	a.m.	
15	12.10	2.21
16	12.54	3.14
17	1.41	4.05
18	2.32	4.52
19	3.27	5.35
20	4.24	6.15
21	5.21	6.51
22	6.18	7.25
23	7.15	7.58
24	8.13	8.31
25	9.11	9.05
26	10.11	9.40
27	11.14	10.20
	p.m.	
28	12.19	11.06

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	12	27	27	42	1	18	29	50
6	13	27	28	42	3	18	32	50
11	25	16	41	31	16	7	47	36
16	29	10	45	24	20	0	52	27
21	25	14	42	29	17	4	49	33
26	15	24	30	40	6	16	35	47
28	12	28	27	43	2	19	30	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	9	47	37	62	21	47	8	39
3	5	52	35	65	19	50	5	44
5	9	51	37	64	21	50	8	43
7	19	42	42	59	27	44	17	36
9	29	31	50	52	35	37	25	27
11	39	22	56	45	41	30	33	19
13	47	12	63	38	47	24	39	12
15	51	6	65	34	49	20	42	7
17	54	4	67	33	51	19	44	5
19	52	8	66	36	50	21	43	18
21	44	16	61	41	45	26	37	5
23	35	25	54	47	39	32	29	22
25	25	36	47	55	32	40	21	31
28	10	49	37	63	22	49	9	41

Phases of the Moon.—Full moon, 6th February, 1.50 a.m.; Last Quarter, 13th February, 7.58 a.m.; New Moon, 21st February, 12 noon; First Quarter, 28th February, 7.12 p.m.

On 15th February the Sun will rise and set 15 degrees south of true east and true west respectively and on 9th and 24th February the Moon will rise and set at approximately true east and true west.

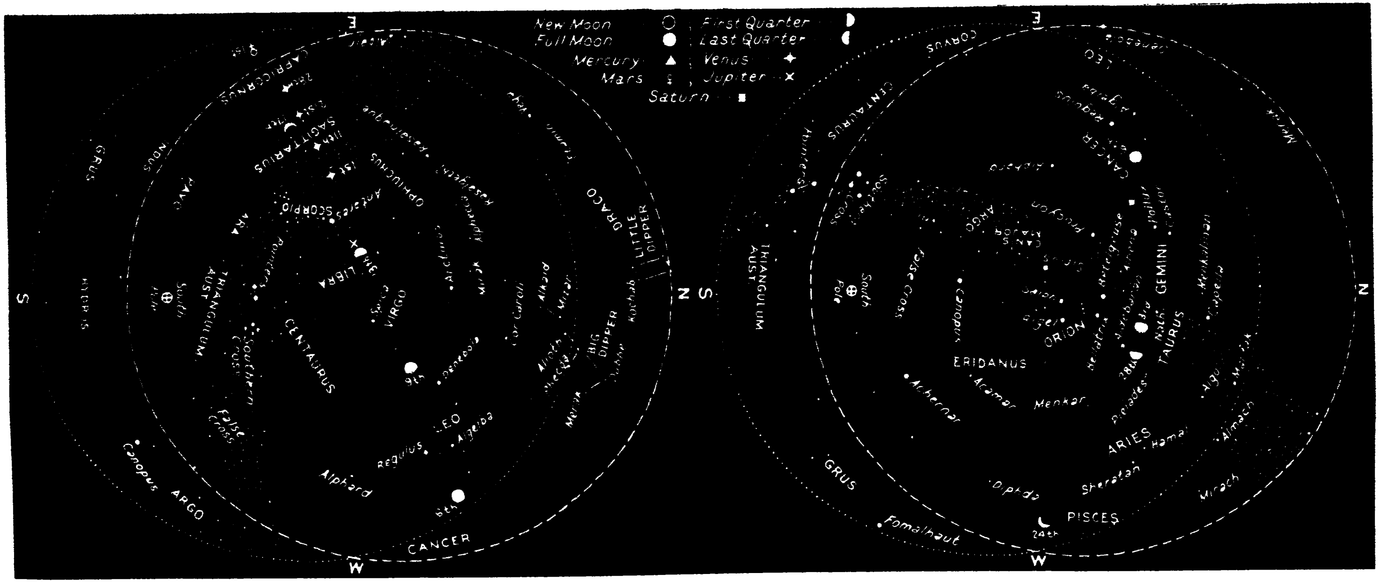
Mercury.—In the constellation of Caprisornus, will set about 30 minutes after the Sun at the beginning of February and on the 21st will reach its greatest angle east of the Sun, when it will set about 45 minutes after sunset. At the end of the month, in the constellation of Pisces, it will sink below the western horizon about 30 minutes after the Sun.

Venus.—At the beginning of the month, in the constellation of Sagittarius, will rise between 1.55 a.m. and 3 a.m. It will continue as a morning object throughout this month and on the 28th will rise between 2.15 a.m. and 3.15 a.m.

Mars.—Still too close in line with the Sun for observation.

Jupiter.—In the constellation of Libra, will rise about midnight at the beginning of the month and between 10 p.m. and 11.15 p.m. at the end of the month.

Saturn.—Is now an evening planet in the constellation of Cancer and will rise about sunset at the beginning of February and about two hours before sunset by the end of the month.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th February. (For every degree of Longitude we go west time increases four minutes.) The chart on the left is for eight hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing North, hold "N" at the bottom; when facing South, hold "S" at the bottom; and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about four minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th, and at the end of the month about one hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

DECEMBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of years' records.	Dec., 1945.	Dec., 1946.
North Coast.	In.		In.	In.
Atherton	7·02	42	5·98	2·02
Cairns	8·53	61	12·31	2·25
Cardwell	7·95	71	5·35	1·12
Cooktown	6·53	67	6·88	4·55
Herberton	5·64	57	3·41	2·14
Ingham	6·77	51	4·15	1·66
Innisfail	11·16	62	5·90	4·86
Mossman	8·00	19	10·09	4·88
Townsville	5·33	72	1·02	1·16
Central Coast.				
Ayr	4·20	56	2·33	1·95
Bowen	4·49	72	1·42	1·40
Charters Towers	3·26	61	2·35	2·08
Mackay	6·86	72	1·90	1·08
Proserpine	7·72	40	2·41	1·15
St. Lawrence	4·67	72	0·33	2·11
South Coast.				
Biggenden	4·85	44	4·92	2·84
Bundaberg	5·10	60	1·12	1·44
Brisbane Bureau	5·05	94	5·32	6·11
Caboolture	5·48	67	2·91	2·94
Childers	5·80	48	1·48	4·50
Crohamhurst	7·19	50	5·14	3·00
Esk	4·76	56	7·74	2·80
South Coast—cont'd.	In.		In.	In.
Gatton College	3·89	44	5·20	..
Gayndah	4·21	72	1·83	4·06
Gympie	5·40	78	2·91	2·05
Kilkivan	4·61	62	2·36	3·00
Maryborough	5·05	72	3·12	2·21
Nambour	6·65	47	8·04	3·51
Nanango	3·86	61	2·63	2·27
Rockhampton	4·67	72	1·08	2·37
Woodford	5·34	55	3·62	2·44
Darling Downs.				
Dalby	3·49	78	3·27	1·82
Emu Vale	3·52	47	2·29	2·98
Jimbour	3·44	64	2·23	2·00
Miles	3·17	58	2·69	2·33
Stanthorpe	3·56	70	3·60	4·00
Toowoomba	4·53	71	5·01	2·21
Warwick	3·50	78	2·86	4·97
Maranoa.				
Roma	2·59	69	2·35	1·26
St. George	2·09	62	1·36	2·31
Central Highlands.				
Clermont	3·77	72	1·13	2·67
Springsure	3·28	74	1·53	2·53

CLIMATOLOGICAL DATA FOR DECEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	88	74	91	13, 17, 31	70	1, 2, 3, 8	225	11
Herberton	..	85	63	92	4	57	1, 2	214	9
Townsville	..	88	76	91	10, 17 18	72	1, 21, 22	116	8
Rockhampton	29·87	92	71	100	9	65	26, 27	237	6
Brisbane	29·91	86	69	99	30	63	4	611	9
Darling Downs.									
Dalby	..	93	67	102	30	54	10	182	7
Stanthorpe	..	83	59	93	27, 30	41	10	400	10
Toowoomba	..	86	62	95	30	46	10	221	10
Mid-Interior.									
Georgetown	29·83	98	75	103	1, 6, 7, 10, 17	68	28	380	5
Longreach	29·82	98	75	109	4, 18	63	10	55	6
Mitchell	29·88	94	69	102	30	57	10	259	8
Western.									
Burketown	..	97	77	106	16, 17	71	29	347	5
Boulia	29·76	101	75	111	13	66	11	67	4
Thargomindah	29·81	95	71	108	20	60	8, 9	86	5

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Volume 64

Part 2

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Edited by
J. F. F. REID
Associate Editor
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Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling, members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

Volume 64 | 1 FEBRUARY, 1947 | Part 2

Event and Comment.

Tobacco-growing in Queensland.

ON his return from the recent meeting of the Australian Agricultural Council at Canberra, the Minister for Agriculture and Stock, Hon. H. H. Collins, stated that an increase in the price of tobacco over rates ruling in 1946, based on grades in the table of limits, amounting to 87½ per cent., over 1939 prices had been approved. It was agreed further to seek an investigation into the desirability of including smoking qualities and aroma in the tobacco leaf price schedule.

Discussing the marketing of tobacco, Mr. Collins said that the Council had recommended consideration of the following resolutions:—

(*a*) That a general marketing authority with majority producer representation be constituted to control the marketing of domestic leaf.

(*b*) The appointment of State committees is not considered essential to the scheme, although their appointment would ensure close liaison with the States on marketing problems.

(*c*) Contracts between growers and manufacturers to be permitted subject to the contracts being approved by the central authority, and proper provision being made for the valuation of leaf grown under contract.

(*d*) That the valuation of leaf should be by an appraisal committee comprising representatives of sellers, buyers, and the central authority.

(*e*) Valuation should be determined by a table of limits based on grades and quality.

(*f*) Allocation of leaf amongst manufacturers should be undertaken by a suitable committee approved by the central authority.

With regard to (*b*), in discussion it was recognized that there would have to be either State boards or some such authority in order to give any Commonwealth board some statutory control.

It would therefore seem that, on the whole, the conference had been favourable to the advancement of the tobacco industry.

Reviewing the position of tobacco growing in Queensland generally, Mr. Collins referred briefly to the history of the industry and the events which led up to the appointment of the Australian Tobacco Investigation Committee about 20 years ago. Tobacco had been grown in Queensland, he said, for over 60 years, but through various causes production declined until in 1926 the aggregate cropped area was less than 100 acres. The tobacco acreage in other States had also diminished seriously. The possibility of reviving the industry was inquired into by the Commonwealth Government and Dr. Darnell Smith was sent to the United States to investigate the conditions of the industry over there. A comprehensive and valuable report on the tobacco soils of the United States was an outcome of this investigation. A study of Australian soil types comparable with those of the American tobacco growing regions followed. The Tobacco Investigation Committee instituted a large number of experiments in Mareeba district of North Queensland, as well as in other States of the Commonwealth. Mareeba was regarded, however, as having the best prospects. Although the number of tests was much greater in Queensland than in the other States, the results were, with some exceptions, all good, Queensland leaf being outstanding especially in respect of combustion and aroma. It was recognized then, as now, that the best leaf was that grown in North Queensland where, in consequence, tobacco growing expanded comparatively rapidly. The industry also received a similar impetus in other States. This general development was arrested, however, by subsequent tariff changes.

As with other crops, tobacco acreage, yield, quality, and price are the essential factors determining the farm income. A good case can be made out for an increase in the price to the Australian tobacco grower to enable the industry to pay a reasonable return on his investment, without unduly increasing retail costs to the consumer.

With an assured and enduring home market and with satisfactory pecuniary adjustments, there is no reason why tobacco growing in Queensland should not develop into a major factor in our rural economy.

Fertilizing Potatoes in the Lockyer Valley.

W. J. CARTMILL, Soils Chemist, Agriculture Branch.

POTATOES have been grown in the Lockyer and Fassifern Valleys for many years, and, in the past, satisfactory crops were produced without recourse to the use of artificial fertilizers. This is evidence that the fertility of the soils was initially high, for the potato is a gross feeder and makes heavy demands on the plant food resources of the soil.

Recently, however, the practice of using artificial fertilizers for potatoes has been adopted by farmers in certain parts of the Lockyer, and most of them claim to have increased yields thereby. Some farmers are using fertilizers on areas where they are probably unnecessary, while others do not fertilize on soils known to be deficient in plant nutrients. Because of a lack of knowledge of the plant food requirements of the soils, the choice of fertilizers is usually haphazard, and mixtures of various kinds are in general use. Information obtained from soils investigations and field experimental plots is given here to assist farmers in choosing the right fertilizer for their soils and so obtain the most profitable returns for the money expended.

Plant Food Requirements.

An adequate supply in the soil of all the essential plant nutrients is necessary for the satisfactory growth of potatoes. The three major plant foods—nitrogen, phosphoric acid, and potash—are required in liberal amounts and a deficiency of any one of them results in low yields being obtained even when the other two are present in sufficient amounts. The three major plant foods are the chief ingredients of artificial fertilizer mixtures, though some mixtures contain only two of them. A mixture containing all three is known as a complete mixture. A complete mixture should be used only when the soil contains insufficient of all three of the major plant-foods to meet the requirements of the particular crop being grown. Some crops are more exacting than others in their requirements of a particular plant food, so that a soil could be deficient in a certain nutrient for one crop yet contain sufficient of that nutrient for the requirements of some other crop.

A knowledge of whether or not a soil is deficient in any particular plant food for a particular crop can only be satisfactorily obtained from a properly conducted experiment on the soil type concerned. Furthermore, such an experiment is necessary to determine the optimum amount of fertilizer to apply to the soil to give the most

profitable crop response. The composition of the soil, determined by chemical analysis, then serves as a useful criterion for assessing the probable requirements of soils of the same type in the same district when the crop is grown under similar conditions.

Signs of Deficiencies.

An extreme deficiency of any one of the plant nutrients is often manifested by characteristic leaf symptoms in the growing plant. For instance, if the nitrogen supply is insufficient the potato plant is stunted in growth, the leaves become a pale yellowish-green colour, and the period of growth is shortened. The tubers from nitrogen-deficient plants are small and the total yield is light. A severe deficiency of phosphoric acid causes the leaves—particularly the terminal or bud leaves—to become a pale-green or bluish-green colour. The plants develop slowly and ripening is delayed. The resultant yield is poor both in number and in size of tubers. Potash-deficient plants assume a stunted bushy habit of growth. The leaves in the early growth period are abnormally dark-green in colour, and later become bronzed in appearance and marked by brown dead-tissue spots. The edges of the leaves curl downward. The lower or oldest leaves may die prematurely and the plant take on a stripped appearance.

Balance in Fertilizer Mixtures.

To obtain the best results from the application of artificial fertilizers, it is necessary to have the mixture properly balanced. In other words, the amount of nitrogen, phosphoric acid, or potash added to the soil should be such as to make the proportion of each present in the soil suitable for the particular crop. This amount will vary according to the soil and the conditions under which the crop is grown. If a soil is inherently high in phosphate content only nitrogen and potash may be required, and the application of a complete mixture to such a soil would not only be poor economy but the addition of the unnecessary phosphate may upset the balance of the nutrients so that the maximum increased yields for the nitrogen and potash added may not be obtained.

Purpose of Using Fertilizers and Manures.

Though potatoes can be grown satisfactorily on almost any well-drained soil of reasonable fertility, the crop thrives best on fertile loamy soils containing adequate quantities of organic matter. The function of the organic matter is to supply soil humus, which, as well as providing plant foods, has a beneficial effect on the structure or tilth of soils, particularly of heavy soils, keeping them loose, open, friable, and permeable to water. Organic matter greatly improves the water-holding capacity of light soils.

The purpose of using artificial fertilizers is simply to correct any deficiency of the major plant-foods in the soil. They do not correct other deficiencies such as lack of organic matter, insufficient cultivation or moisture deficiency, nor do they make a naturally poor soil fertile.

A soil which is inherently fertile may become depleted of one or more of its plant-foods by the removal of crops from the soil over a period of years to such a degree that there remains insufficient of the

nutrient or nutrients to satisfy the requirements of all crops. Other factors also cause a depletion of plant nutrients in a soil under cultivation, and of these the decomposition of humus, which causes a loss of nitrogen and the leaching out of plant foods from the top soil by water, is important. The loss of humus can be retarded by turning under crop residues and green manures. The best green manures are leguminous crops, such as cowpeas, which add nitrogen to the soil as well as organic matter. The loss of mineral plant foods (for example, phosphate and potash) must be made up by using fertilizers; and it is often necessary to supplement the nitrogen supply by using inorganic nitrogenous fertilizers even though a green manure has been turned under.

The best artificial fertilizer to use for the purpose of supplying nitrogen for the potato crop is sulphate of ammonia. Nitrate of soda is sometimes used, but for the conditions under which potatoes are grown in the Lockyer and Fassifern Valleys its use is not recommended. Potash is usually applied as muriate of potash or sulphate of potash, and phosphates, when required, as superphosphate. Phosphate fertilizers are not required in the Lockyer soils.

The Soils of the Lockyer Valley.

Soils investigations conducted in the Lockyer Valley during the last three or four years have revealed that considerable variation exists in the chemical and physical composition of the alluvial soils of the valley. While the inherent fertility of the soils is generally good, laboratory investigations have indicated that certain deficiencies may occur in some areas, more particularly in relation to nitrogen and potash. The phosphate status of the soils is high in all parts of the valley, and the phosphate is present in a form that is readily available to plants.

The soils have been formed from unconsolidated alluvial deposits of considerable thickness laid down on the valley floor. In texture they range from sandy loams to clays, but clay loams and clays are dominant. The lighter soils occur mainly at the western end of the valley beyond Gatton and up Tent Hill, Flagstone, and Ma Ma Creeks. Below Gatton the soils are heavier and clay loams and clays are the chief soil types over the main part of the valley. Lighter soil types occur in places along the creek banks, which is in accord with normal flood plain deposition. The soils of the Laidley Creek Valley are also of the heavier type, though they get lighter towards the head of the creek.

The lighter soils are characterized by a generally low nitrogen content and a high available phosphate and potash content. The heavier soils have mostly a fair nitrogen content, and are high in available phosphate, but their potash contents vary considerably, being quite low in some areas though generally satisfactory. The soils have one property in common—they all contain an abundant supply of available phosphate.

Potatoes are grown on all the soil types, but the most favoured for the crop are the lighter permeable soils such as occur at the head of the creeks and the "creek-bank" soil.

Fertilizer Trials.

So far only a small number of field experiments have been conducted. The results obtained from these confirm the general deductions in regard to nutrient deficiencies arrived at from the analytical data obtained for the various soils. Thus soils low in nitrogen content respond to applications of nitrogenous fertilizers, and soils low in potash to potash fertilizers. No response to phosphate has been obtained.

The first field experiment was laid out in the spring of 1944 on a grey-brown clay loam typical of a broad area of alluvial soil on the south side of Lockyer Creek between Grantham and Gatton. In this experiment a response to nitrogen applied as sulphate of ammonia was obtained, but none to phosphate and potash. The experiment was repeated on another farm on the same soil type in the autumn of 1946, and similar responses were obtained.

Yield data obtained in the latter experiment for applications of sulphate of ammonia are shown in the following table:—

Amount of Sulphate of Ammonia (cwt. per acre).	1st Grade Tubers (tons per acre).	1st and 2nd Grade Tubers (tons per acre).
Nil	4·4	5·4
2	4·8	5·8
4	5·5	6·5

The increased yield of first grade tubers due to an application of 4 cwt. per acre of sulphate of ammonia amounts to over 1 ton per acre, which is a very profitable response.

In the same season a similar experiment was set out on Laidley Creek, near Mulgowie. In this case a response was obtained to potash. Nitrogen and phosphate applications proved to be of no value.

Yield data for this experiment for muriate of potash applications were as follows:—

Amount of Muriate of Potash (cwt. per acre).	1st Grade Tubers (tons per acre).	1st and 2nd Grade Tubers (tons per acre).
Nil	4·4	4·9
1	5·0	5·5
2	5·5	6·0

The increase in yield due to an application of 2 cwt. per acre of muriate of potash was over 1 ton of first grade tubers per acre.

Recommendations.

Until further field trials have been conducted, it is not possible to make specific recommendations for all the soil types of the Lockyer, but with the knowledge obtained from the experiments so far

conducted, together with the analytical data for soils representative of all parts of the district, certain broad general recommendations can be made.

Lockyer Creek Area.

The grey-brown soil covering the area south of Lockyer Creek between Grantham and Gatton appears to be deficient in nitrogen for the potato crop, and benefits from applications of sulphate of ammonia may be expected. Amounts of up to 4 cwt. per acre profitably increase the yield of first grade tubers on that soil.

Tent Hill, Ma Ma and Flagstone Creeks Areas.

Soils of a similar type and similar in chemical composition occur on Tent Hill, Ma Ma and Flagstone Creeks, and it is probable that these soils would also benefit by applications of sulphate of ammonia.

Laidley-Mulgowie Area.

The soils in the Laidley-Mulgowie area of the Laidley Creek valley are characteristically low in potash and in a field trial potatoes responded well to applications of muriate of potash. Rates of up to 2 cwt. per acre returned profitable increases in yield of 1st grade tubers. Phosphate fertilizers are of no value, as the soils in that area contain adequate quantities of this plant food. Nitrogen applications also proved to be unnecessary in the field trial. Chemical analyses indicate that, although most soils in this area contain fair quantities of nitrogen, the amount of this plant food varies in the soils of the area. The system of farming, intensity of cropping, of cultivation, or irrigation and other local factors could cause a variability from farm to farm. It is possible, therefore, that on some farms applications of nitrogenous fertilizers may be beneficial. Further experiments are required to determine this. Until further information is available farmers in this area are strongly advised to plough under a leguminous green manure crop prior to planting potatoes in order to improve the nitrogen status of the soils and offset any possible deficiency of the nutrient.

General.

At present the fertilizer trials are not sufficiently far advanced for a statement of the precise fertilizer requirements (if any) of all the soils of the Lockyer. It would appear, however, from the chemical data available for the various soils that there is a possibility of a nitrogen deficiency occurring in some areas. To provide for any such contingency (partially at least) and until the results of field trials are known, the ploughing under of a leguminous green manure crop before planting potatoes would be a sound practice for farmers to adopt in all parts of the district.

Potash is present in fairly good amounts in most of the soils of the Lockyer, and unless shown to be beneficial by field experiments the general use of potash fertilizers is not advised. Quite probably some soils other than those already known to be potash-deficient will be found to require potash as a soil amendment, but the areas are not likely to be extensive. At the same time it should be realized that potatoes are heavy users of potash, so that a soil repeatedly cropped to potatoes could, in time, become potash deficient although the soil type in general may be well supplied.

Phosphate is abundantly supplied in all the alluvial soils of the valley, and phosphate fertilizers are unnecessary.

The soils are slightly acid to slightly alkaline in reaction, though mostly neutral. The use of lime or dolomite is therefore unnecessary, and moreover is undesirable because of the probability of increasing the incidence of "scab".

Time and Method of Application of Fertilizers.

Fertilizers are usually applied in the drill at planting time. When this method is used, care should be taken to ensure that the fertilizer is covered by a layer of soil or mixed with the soil in the drill before the setts are placed because of the risk of injury to the setts by contact with the fertilizer, which would produce "misses" in the crop.

Work in other countries, more particularly in America, indicates that best yields are obtained when the fertilizer is placed in bands 2 inches to each side of the setts and at a slightly lower level.

Other work has shown that when sulphate of ammonia is used as a fertilizer the highest yields are obtained when about half the fertilizer is applied at planting time, and the remainder applied as a side dressing at about the flowering stage.

QUEENSLAND SHOW DATES FOR 1947.

March.

Pittsworth ... 4th and 5th
Millmerran ... 7th and 8th
Cherbourg ... 7th and 8th
Goombungee ... 8th
Toowoomba ... 17th to 20th
Dalby ... 25th to 27th
Tara ... 28th and 29th

April.

Chinchilla ... 1st and 2nd
Miles ... 17th and 18th

May.

Mount Perry ... 2nd
Marburg ... 3rd
Kingaroy ... 3rd and 5th
Taroom ... 5th, 6th, and 7th
Yarraman ... 5th and 6th
Monto ... 7th and 8th
Nanango ... 8th, 9th, and 10th
Beaudesert ... 9th
Ipswich ... 13th to 16th
Wondai ... 15th, 16th, and 17th
Murgon ... 22nd, 23rd, and 24th
Esk ... 22nd, 23rd, and 24th
Warrilview ... 23rd
Biggenden ... 29th and 30th
Gympie ... 29th, 30th, and 31st
Kalbar ... 30th
Blackbutt ... 30th and 31st

June.

Maryborough ... 5th, 6th, and 7th
Boonah ... 6th and 7th
Childers ... 9th and 10th
Gladstone ... 12th and 13th
Bundaberg ... 12th, 13th, and 14th
Lowood ... 13th, 14th, and 16th
Gin Gin ... 16th and 17th
Rockhampton ... 18th to 21st
Toogoolawah ... 20th and 21st
Mackay ... 24th, 25th, and 26th
Laidley ... 27th
Proserpine ... 27th and 28th

July.

Charters Towers ... 1st, 2nd, and 3rd
Kilcoy ... 3rd and 4th
Rosewood ... 11th and 12th
Nambour ... 17th, 18th, and 19th
Gatton ... 18th and 19th
Crow's Nest ... 30th and 31st
Innisfail ... 31st, and 1st and 2nd

August.

Lawnton ... 2nd
R.N.A., Brisbane ... 9th to 16th

September.

Rocklea ... 13th
Beenleigh ... 19th and 20th

ANT PROTECTIO

The Scale Control Programme in Citrus Orchards.

A. W. S. MAY, Assistant Entomologist.

QUITE a number of scale insects are common pests of citrus and the several species exhibit different breeding habits. Nevertheless, the late summer-autumn period has been found a most appropriate time to apply control measures. In addition, weather conditions at this time of the year are reasonably cool and the trees are less liable to injury than they would be during the hotter weather of mid-summer.

Red, circular black, mussel and soft scales have four or more generations each year and breeding is continuous during the warmer months. The maximum rate of reproduction occurs during January, but as the cooler autumn weather approaches the breeding rate slackens prior to the onset of partial dormancy during the winter. Pink wax scale has only two generations each year, the first occurring in November and the second in March. The hatching of white wax scale, on the other hand, may be protracted through the summer months, though this insect has only one generation each year.

Scalicides are particularly efficient against newly hatched scales and accordingly their application should, where possible, be timed to coincide with the occurrence of young insects on the trees. Such conditions are normally encountered between February and April. As the breeding rate is then declining, scale populations can be drastically reduced and the trees enter the winter in good condition and remain clean for a relatively long period.

Scalicides.

In coastal areas most citrus growers rely on sprays for the control of scale insect pests. Various insecticides are used according to the type of scale or scales to be controlled.

A white oil emulsion, at 1 in 40 strength, is used extensively against red, circular black and the soft scales. It is rather less efficient against the mussel scale, and is of little value against the wax scales, particularly when more mature individuals are predominant among the population.

A soap and washing soda spray is recommended for use against the pink wax scale, but good results can only be expected when treatment follows after the emergence of the second generation "crawlers,"

which occurs between late February and April. This spray is mixed according to the following formula:—5 lb. high grade laundry soap, 12-14 lb. fresh washing soda, and 75 gallons water.

The resin—caustic soda—fish oil spray is a very efficient scalicide, the value of which lies mainly in its ability to control a mixed infestation of species, including either or both the pink wax and white wax scales. A stock emulsion may be prepared on the orchard to the recommended formula or purchased commercially for dilution when required.

In inland districts, where red scale is the predominant scale insect pest encountered, fumigation is the primary control measure for all scale pests in the late summer-autumn period. The efficiency of this treatment may be lessened by unfavourable weather conditions or the use of worn sheets. An alternative method of controlling red scale in these districts requires the use of a white oil (1-40) spray, applications of which are less subject to the vagaries of the weather than is fumigation.

Combination Sprays.

Invariably, orchardists find it necessary to cope with a mixed population of scale insects in their trees and a combination spray containing soap, washing soda and white oil is very useful on trees infested with red, circular black, mussel and the wax scales. It is prepared according to the following formula:—2 lb. high grade laundry soap, 8 lb. fresh washing soda, 1½ gallons white oil and 75 gallons water. In hot weather, this mixture may burn the foliage and its use should be confined to relatively cool periods in the late summer and autumn months.

In coastal districts where brown spot is a disease of Emperor mandarins, a combination spray containing cuprous oxide mixture (honey formula, 3-40) and white oil may be employed when red scale is present on the trees. The fungicide may also be combined with the soap-washing soda mixture used for pink wax scale control. A further combination, comprising cuprous oxide, together with soap-washing soda-oil, is also useful to combat brown spot and a mixed infestation of red scale, mussel scale and pink wax scale on trees of this variety.

Conditions Necessary for Control Measures.

Scale control measures during the late February-April period should be timed to coincide with the emergence of a new generation of the pest. In the case of pink wax scale, the late summer brood of young scales may be expected to appear between late February and late April. "Crawler" emergence is normally spread over a period of approximately one month and spraying should be delayed until it is completed. By this time the older individuals will have attained the size of an ordinary pin head. The efficiency of a soap-washing soda spray drops quickly from that time onwards. Consequently, if many of the young scales are larger than an ordinary pin-head, it may be wise to substitute the somewhat more efficient resin–caustic soda–fish oil spray for the soap–washing soda mixture normally used.

In the case of red, circular black and mussel scales, individuals of all ages are invariably present on the trees and the timing of control measures is far from easy. However, late summer-autumn has proved the most suitable period for the control of these species. Treatment then ensures that the fruit will be free from infestation when harvested.

The time of application of a scalicide is no more important than the method of using it. In the case of all sprays, the ingredients should be measured accurately and fresh materials should be employed wherever possible. Thorough agitation of the spray in the vat is essential during its application.

Although an efficient spray may be employed, the insect must be wetted by the spray before results can be expected. It is not an easy task to thoroughly wet a large citrus tree with the spray, but every effort should be made to achieve this object and so obtain the maximum benefit from the treatment.

Generally speaking, weather conditions are usually more favourable for the use of scalicides in late summer-autumn than at other periods of the year. Nevertheless, citrus growers should postpone control measures if temperatures are abnormally high, for the foliage and tender twigs are easily scorched. This condition applies particularly to the use of the soap–washing soda–white oil combination spray. Vigorous healthy trees are better able to withstand the effects of spray applications during periods of warm weather than trees showing symptoms of stress.

Spray Applications and Fruit Maturity.

The time of application of scale control measures is particularly important in districts where red, circular black and mussel scales are common pests. Control measures should be applied sufficiently early to ensure clean fruit at harvesting which will realise the full market value of the crop. Early varieties of citrus, such as lemons and grapefruit, are therefore usually treated for red scale control during January. Varieties such as navel and Joppa oranges, which may not be harvested until late March and April, are best sprayed between mid-February and early March, depending on the occurrence of suitable weather for treatment. Scale control measures can be applied to mid-season and late varieties at any time during March and April.

However, it must be borne in mind that an interval of approximately one month must elapse between the use of an oil spray and harvesting, for colouring of the fruit can be delayed if this interval is reduced.

CHANGE OF ADDRESS.

Changes of address should be notified at least fourteen days before the date of issue with which the change is to take effect. The former address should be given as well as the full Christian names and surname of the subscriber.

Address all communications to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Control of the Cotton Web-Spinner.

IAN F. B. COMMON, Assistant Entomologist.

DURING the spring of 1946 a number of crops in central and southern Queensland, including cotton, peanuts, lucerne, sorghum and Sudan grass, were damaged by the cotton web-spinner.* The larvae of this pest are readily recognised, for they are associated with large quantities of webbing which they spin over their host plants. The

Plate 22.
ROLY POLY WEED DEFOLIATED BY COTTON WEB-SPINNER.

adults are small, inconspicuous, greyish-brown moths which become very numerous in the field and around artificial lights, to which they are strongly attracted.

Sources of Infestation.

Cotton web-spinner moths lay their eggs on a number of weeds commonly found growing on fallow land, on headlands and amongst crop plants where cultural operations have failed to keep the area clean. Such weed hosts include black pigweed, red pigweed, hogweed,

* *Loxostege affinitalis* Led.

roly poly and Bathurst burr. Lucerne is the only cultivated crop upon which egg-laying has been observed. Frequently very large populations of the larvae develop on weeds and lucerne and these provide a source of infestation for neighbouring crops. When the weeds or lucerne are severely damaged by the larvae, or are no longer suitable for their development, the pest is likely to invade cotton and other crops nearby.

Nature of Damage.

The weed hosts of the cotton web-spinner are generally completely defoliated (Plate 22) during an attack, but in most cases recovery of the plants follows further rain. The foliage of lucerne is skeletonised

Plate 23.
TWO MONTHS OLD COTTON PLANT, SHOWING COTTON WEB-SPINNER DAMAGE.

and webbed together, thus greatly reducing the quantity and the quality of the hay produced. If other crops are attacked while young —and for the most part this is the case when an outbreak occurs in the spring—replanting is frequently necessary. Especially does this apply where weeds are prevalent amongst the crop plants, for once the infested weeds are destroyed by the insects or removed by cultivation, the larvae turn their attention to the only remaining source of food—the young crop plant. If the larvae are numerous, defoliation of the young plants is often fatal even when insecticides are applied.

An attack by the cotton web-spinner on older crop plants may cause considerable leaf damage (Plate 23), before control measures are effective, but usually the tips remain uninjured and, if growing conditions are good, the plants frequently will recover.

Life History and Habits.

The adults of the cotton web-spinner lay their small, scale-like eggs, which overlap one another, in groups of up to nine usually on the fresh young growth of some weeds and lucerne. In from two to four days in summer the young larva hatches from the egg and soon begins to spin over the host plants the characteristic webbing in which it is capable of rapid movement, either forwards or backwards. In summer, after about three weeks' development, the larva descends to the ground and enters the soil, where it constructs a silk-lined tunnel up to one and a half inches in depth. At the bottom of this tunnel transformation to the pupal or resting stage takes place. About one week afterwards the moth emerges.

The winter is spent in the pupal stage and the moths emerge following September rains. The larvae hatching from the eggs laid by these moths complete their development in late October. The second generation of moths is therefore on the wing in early November and the larvae produced by them are prevalent during the remainder of that month. It was this November generation of larvae which recently proved so troublesome in central and southern Queensland.

Further generations of the pest may occur before the end of the summer, but their fate is governed by such factors as climatic conditions and the relative activity of natural enemies. Small parasitic wasps and flies are the most important natural enemies of the cotton web-spinner and, under normal circumstances, they are effective in preventing outbreaks.

Control Measures.

Methods adopted for the control of the cotton web-spinner vary according to the source and extent of the attack. It is important to remember that egg-laying seldom, if ever, occurs on cultivated crops other than lucerne. Thus attacks upon cotton, peanut, sorghum and Sudan grass crops are always in the nature of larval invasions from other host plants, such as lucerne and weeds, upon which the earlier development of the insect has taken place. Such invasions may originate from weeds growing within the crop, from weeds on headlands or from weeds and lucerne in adjacent cultivation paddocks.

Where lucerne is heavily infested with cotton web-spinner larvae, the crop should be cut immediately. Any adjacent crops should then be watched closely in case protective measures are necessary to destroy larvae migrating from the lucerne.

The maintenance of cultivated crops free from weed growth cannot be too strongly emphasised as a counter against this and other pests. It has been noted again and again that crops growing under conditions of clean cultivation and situated some distance away from weedy headlands and fallow ground remain free from attacks by the cotton web-spinner. Should large numbers of larvae be observed attacking weeds within or adjacent to a crop, prompt action must be taken. The weeds should be sprayed or dusted immediately with

D.D.T. or lead arsenate in order to destroy the insects. On no account should cultivation be attempted until the insects on the weeds have been destroyed, for any mechanical disturbance of the weed hosts will lead almost inevitably to an invasion of the crop by the larvae.

If the larvae have begun to migrate from outside the paddock towards the crop, one or more furrows should be drawn across their path and a cutworm bran bait distributed in the furrows and amongst the advancing larvae. This bait contains 25 lb. bran, 2 quarts molasses, 1 lb. Paris green and 2½ gallons water mixed into a wet, crumbly mash.

Frequently an invasion of the crop has already commenced when first the pest is noticed. The invaded area and a marginal strip at least 12 feet in width should be sprayed immediately with an 0.1% D.D.T. emulsion or dusted with a 2% D.D.T. dust. If the plants are small, this measure may not save those already attacked, but it should destroy most of the invading larvae before the remainder of the crop is affected. However, if the larvae are present in very large numbers and the invasion is well advanced before it is noticed, the crop can be defoliated completely before the insecticide has time to destroy the insects, and replanting may be necessary.

In earlier outbreaks, when cotton plants at least one month old have been attacked, effective control was obtained by sprinkling a swabbing mixture on the plants with a whitewash brush. The swabbing mixture contains 1 lb. lead arsenate, 1 gallon molasses and 6 gallons water. This mixture is easy to apply and can be used most economically. Because of the danger of poisonous residues, insecticides containing arsenic cannot be applied to fodder crops which are to be fed to stock.

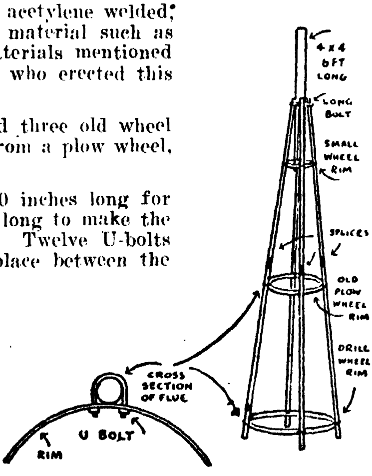
HOME-MADE TOWER FOR WIND-CHARGER.

To make a tower for a battery charger, take some boiler flues from an old steam engine and get them acetylene welded, making four pipes each 16 ft. long. Other material such as piping can, of course, be used, but the materials mentioned here are those used by the farmer concerned who erected this type of tower.

A piece of 4 x 4 about 6 feet long and three old wheel rims were used, one from a drill wheel, one from a plow wheel, and a third about 12 inches in diameter.

Four long bolts were used, two about 10 inches long for the top of the flues and two about 14 inches long to make the 4 x 4 secure in the small rim at the top. Twelve U-bolts were used, four to fasten each rim in its place between the upright flues.

This makes a tower 18 ft. high and one that will last a long time. It can be made secure to the ground by means of iron stakes or cement blocks. Such a tower would therefore be quite easy to make from scrap material and, if no wheel rims were available, something else could be devised to do in their place.



—*From "Handy Farm and Home Devices and How to Make Them."*

APPLIED BOTANY

Plants Poisonous to Sheep.

S. L. EVERIST, Assistant Botanist.

January

(*Continued from ~~December~~, 1947, page ~~25~~ 13.*)

Ellangowan Poison Bush.

Other Common Names: Turkey bush, dogwood.

Botanical Name: *Myoporum deserti*, A. Cunn.

Description: Shrub, 3-5 feet high; branches thin; leaves alternate, thick in texture, narrow, 1-2½ inches long, tapering to a fine point; flowers white, bell-shaped, about ¼ inch diameter, borne singly or in clusters of 2 or 3 on curved stalks in the forks of the leaves; fruits round, about ¼ inch diameter, leaves bitter and burning to taste. (See Plates 24 and 25.)

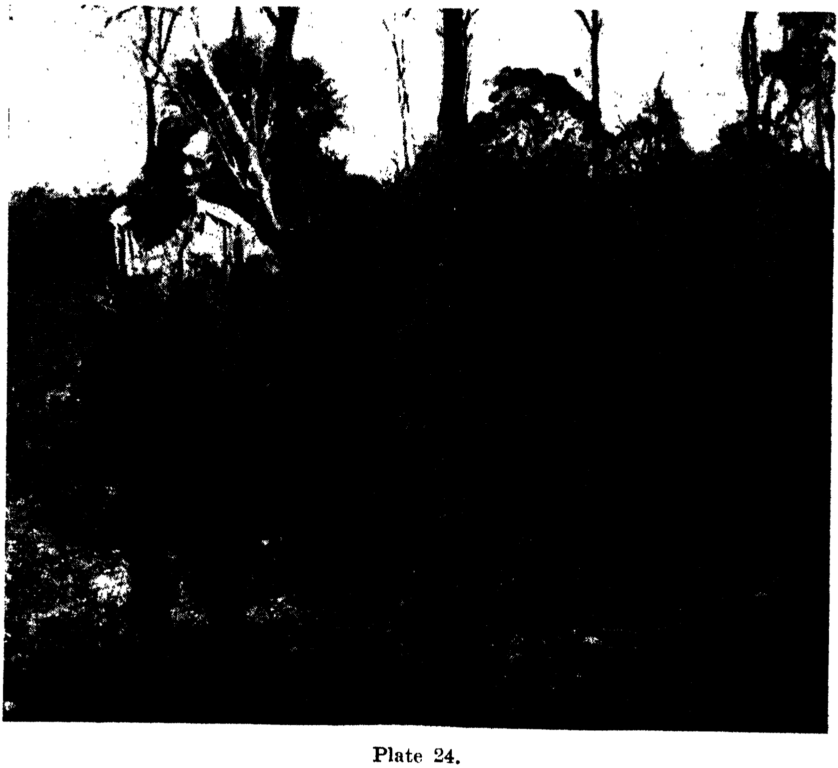


Plate 24.

ELLANGOWAN POISON BUSH.—Mature plants, west of Springsure.

Distribution: The plant is common in Western Queensland and extends to the Burnett, Wide Bay, Port Curtis, and Moreton districts, though it is not common in coastal areas. It grows in a wide range of soils but is most plentiful in forest country, especially ringbarked gidyea, brigalow, and box forests.

Seasonal Occurrence: Deaths are not confined to any one season and the plant is potentially dangerous at all times.

Evidence of Poisoning:

(*a*) Field: On many occasions Ellangowan poison bush has been suspected of causing deaths of both cattle and sheep. The plant has a delayed action and animals often remain unaffected until two or three days after eating it. A drink of water hastens the onset of symptoms.

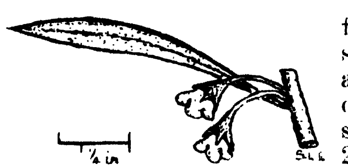


Plate 25.
ELLANGOWAN POISON BUSH.—Twig with leaf and flowers.

(b) Feeding Tests: The plant was fed to sheep at Cunnamulla and produced symptoms characteristic of those shown by animals affected on stock routes. A total of $1\frac{3}{4}$ lb. of leaves and fine twigs fed to a sheep produced no symptoms for the first 24 hours, but killed the animal in 48 hours. Minced leaves and fruits produced symptoms after 4 hours when 8 ounces had been consumed, the animal dying in 48 hours after eating 12 ounces of the material.*

(*c*) Chemical: It has been reported than an oil contained in an allied plant (*Myoporum acuminatum*) is a general tissue poison and it is possible that Ellangowan poison bush contains a similar oil.

Symptoms: The symptoms are described *as drowsiness with gradual closing of eyelids, lowering of head, and arching of back; body temperature became sub-normal and respiration deep. Later the sheep collapsed and lay on the brisket, became semi-comatose and could not run when disturbed. Watery swelling of the jaw and yellowed membranes were noted prior to death.

Post Mortem: The main features reported on post mortem were some yellowing of mucous membranes, excess amber fluid in all body cavities, stagnation of the lower bowel with severe drying out of contents and haemorrhages of most surfaces lining the intestines. Blood was usually plentiful inside the intestines.

Prevention: Paddock sheep sometimes eat this plant sparingly, apparently without ill-effect. If eaten by travelling stock it is very dangerous. In moving sheep or cattle through patches of this plant, the best plan is to let them feed for an hour or more before entering the patch, then keep driving them until poison-free pasture is reached. To camp mobs of sheep or cattle where Ellangowan poison bush is growing generally leads to heavy losses.

Treatment: No remedy is known.

Caustic Vine.

Other Common Names: Caustic bush, pencil caustic.

Botanical Name: *Sarcostemma australe* R.Br.

Description: Leafless scrambler or bush with smooth, greyish-green, jointed stems often climbing to the tops of trees and hanging

* Johnstone, I. and Allen, G.: *Aust. Vet. Journ.* Vol. 20, p. 227, 1944.

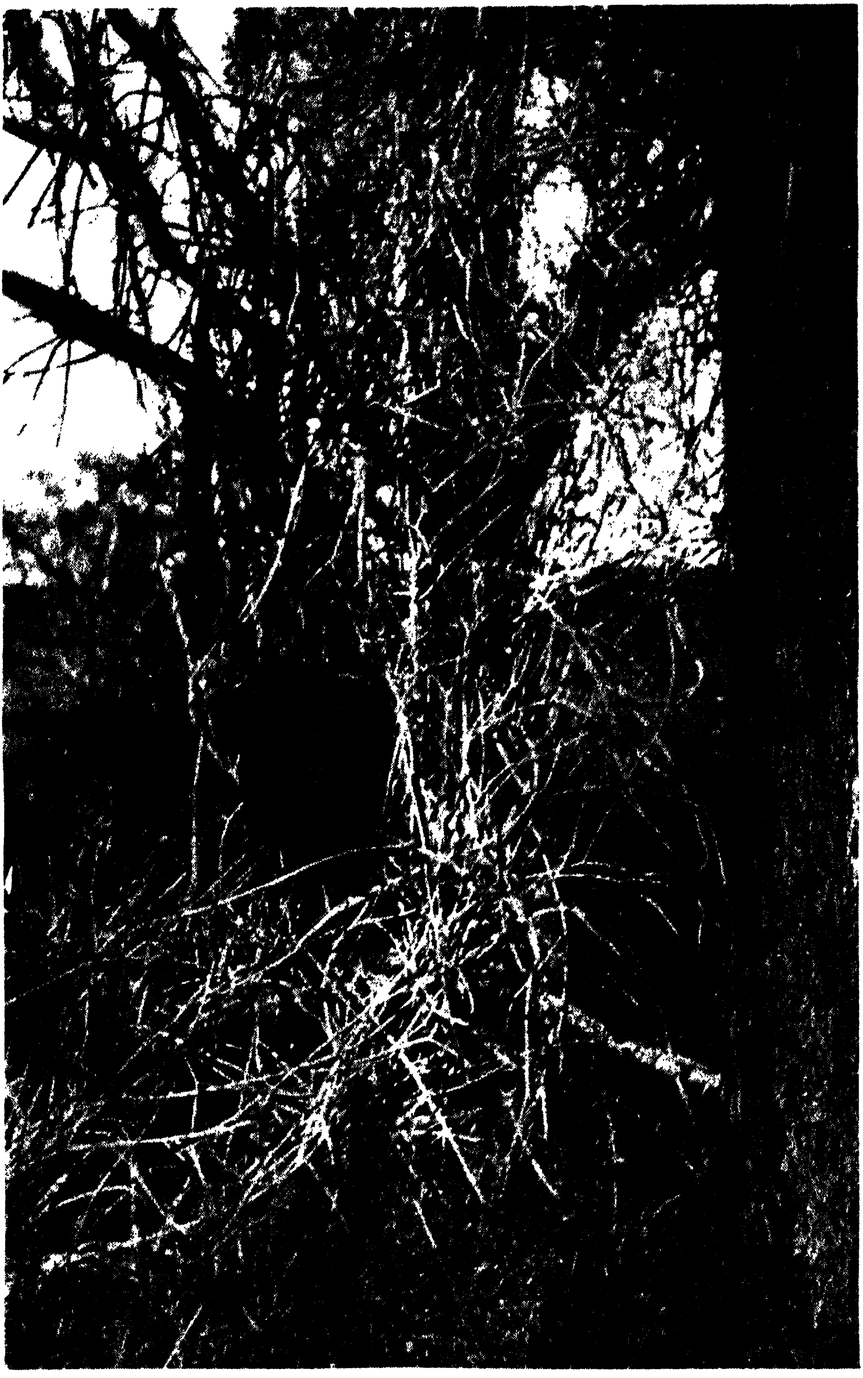


Plate 26.
CAUSTIC VINE.—Mature plant, near Eudlo.

down from the branches; stems with milky juice; flowers creamy-white, star-shaped, in clusters at the joints; pod 2-3 inches long, pointed at the top, splitting lengthwise when ripe; seeds flat with a tuft of silky hairs at one end. (See Plates 26 and 27.)

Distribution: Caustic vine is found in nearly all parts of the State in a variety of situations. It often grows on rocky hills and tablelands.

Seasonal Occurrence: In good seasons the plant is not eaten to any extent. Most trouble occurs in dry times when other feed is scarce.

Evidence of Poisoning:

(*a*) Field: For very many years the plant has been suspected of killing sheep and cattle.

(*b*) Feeding tests: In feeding tests *sheep have been killed with as little as 2 ounces of the fresh minced plant and the plant has also been fed to cattle and horses with fatal results.

(*c*) Chemical: Caustic vine has been found to contain a saponin.

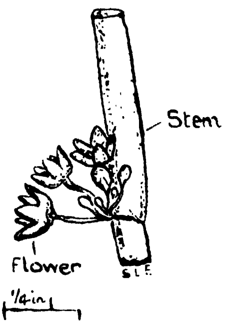


Plate 27.
CAUSTIC VINE.—Portion of stem with flower cluster.

Symptoms: The symptoms have been given as follows:—†"The animal first appears restless and uncomfortable. Later, staggers develop and the animal goes down, breathing becomes rapid, and the animal grunts. It makes violent running movements when down, the head may be thrown out stiffly, neck muscles show great rigidity for a time and then relax. Sometimes the animal will shut the mouth tightly and resist any effort to open it. At other times there is a marked champing of the jaws with grinding of the teeth and free flow of saliva. Vomiting may occur. Gradually the running movements become weaker and the animal dies.

Post Mortem: Post-mortem examination reveals little abnormality. The paunch is distended with gas and there may be a clear, straw-coloured fluid in the chest cavity.†

Prevention: If the plant is not too plentiful it is best to grub it out. If this is not possible, it is well to keep hungry sheep out of reach of caustic vine unless ample other feed is available in the paddock. Care should be taken in handling the plant as the sap is sometimes irritant to the skin, especially to people with fair complexion.

Weir Vine.

Other Common Names: None reported.

Botanical Name: *Ipomaea calobra*, Hill and F. Muell.

Description: Vigorous vine with numerous trailing stems from a thickened rootstock; lateral roots bearing large watery tubers about 1-2 feet below the soil surface; leaves on long stalks, heart-shaped, sometimes more than 4 inches across; flowers funnel-shaped, about 3 inches across, borne in loose clusters on long stalks; "petals" changing colour from pink to blue; seed pods rounded, ¾-1 inch diameter, containing several dark, angular seeds. (Plate 28.)

* Gilruth, J. A., and Murnane, D.: *Jour. C.S.I.R.*, iv., p, 225, 1931.

† Moule, G. R.: Department of Agriculture and Stock: Advisory Leaflet, Vet. Sec. 30, 1942.

Plate 28.

WEIR VINE (*Ipomœa calobra*).—A. Base of corolla laid open to show stamens. B. Capsule. C. Seeds. The whole reduced to the same scale.

Distribution: Weir vine has a very restricted distribution. So far as is known, it occurs only on red soils with mulga and ironbark in the districts around St. George, Surat, and south of Roma.

Seasonal Occurrence: In infested areas this plant is usually the first to grow after early spring rains. It is killed by frost. Some people regard it as most dangerous after spring rain when it is in vigorous growth and other feed is comparatively scarce, while others consider it is most poisonous when bearing seed pods.

Evidence of Poisoning:

(*a*) Field: For many years the plant has been strongly suspected of causing losses in sheep and field evidence against it is fairly conclusve.

(*b*) Feeding tests: The limited feeding tests which have been carried out have given negative results, but in view of the field evidence this cannot be regarded as conclusive.

(*c*) Chemical: No work on determination of a poisonous principle has been reported.

Symptoms: It is reported *that affected animals become excited when worked and raise their heads and tails, pointing them straight out. They develop staggers. The knee joints become swollen and apparently the animals do not recover from this condition even when put on good pasture.

Post Mortem: Post-mortem examination of sheep showing signs of weir vine poisoning but taken off weir vine country 10 days previously showed all organs normal, except the lungs, which were much enlarged and, apart from dark blotches, pale in colour.*

Prevention: Experiments by the Lands Department indicate that eradication of the plant is not difficult, though it costs from 13s. 6d. to 15s. per acre to clear most country of weir vine. The best method of eradication is to grub the vines, then pour over the exposed central root about an egg-cupful of arsenic pentoxide solution (1 lb. arsenic pentoxide to 1 gallon water). Such treatment kills the whole of the root system, including the tubers.

During the winter, sheep may be run on weir vine country without ill effects. With early spring rains, even as little as 50 points, weir vine comes up and such country then is dangerous until the first frosts have killed the vines.

Soda Bush.

Other Common Names: None recorded.

Botanical Name: *Threlkeldia procceriflora* F. Muell.

Description: Erect, densely branched herb or subshrub up to 2 ft. high; leaves alternate, succulent, very narrow, almost cylindrical, ¼-¾ in. long; flowers and fruits in forks of leaves, closely pressed against the stem, cylindrical, hard, dry, about ¼ in. long, with five very short, narrow teeth at the top. (See Plates 29 and 30.)

NOTE.—The cylindrical fruit closely pressed against the stem and without sharp spines serves to distinguish this plant from two very similar plants, red burr† and yellow burr.‡

* Carew, J. Unpublished report, Department of Agriculture and Stock files, 1934.

† *Bassia echinopsila* F. Muell.

‡ *Bassia anisacanthoides* (F. Muell.) Anders.

Distribution: Soda bush is common in Western Queensland, where it grows in great abundance on heavy clay soils, especially on stock routes, reserves and other heavily grazed areas in the region between Charleville and Longreach.

Seasonal Occurrence: The plant is most plentiful after spring and summer rains. If rain falls in late summer or autumn, soda bush persists well into the winter.

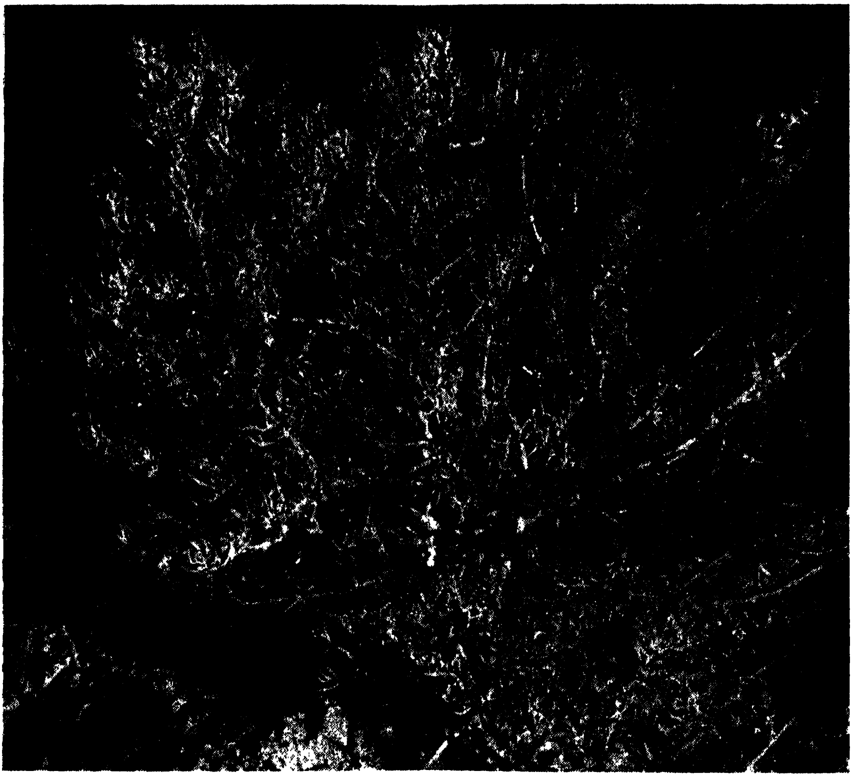


Plate 29.
SODA BUSH.—Mature plant, near Barcaldine.

Evidence of Poisoning:

(*a*) Field: Soda bush first came under suspicion in 1938 after heavy losses in sheep in the Ilfracombe and Longreach districts. Since then many losses have been attributed to the plant.

(*b*) Feeding tests: Tests at Yeerongpilly‡ showed the plant to be poisonous to sheep. One merino wether was killed by 1 lb. of minced plant, two by 2 lb. each and two others by 5 lb. each. One ate 3 lb. without apparent effect.

(*c*) Chemical: A high oxalic acid content has been recorded in specimens from Western Queensland. Animals fed experimentally

‡ Legg, J., and Francis W. D.: *Aust. Vet. Journ.* xv, pp. 168-171, 1939.

became hypocalcaemic (deficient in blood calcium). The lowering of blood calcium follows when oxalic acid in the plant combines with the calcium in the blood to form insoluble calcium oxalate.

Symptoms§: Deaths from soda bush poisoning occur at two fairly clearly defined periods:—

(*a*) A few hours after eating the plant (most deaths occur in this period).

(*b*) Up to several days later.

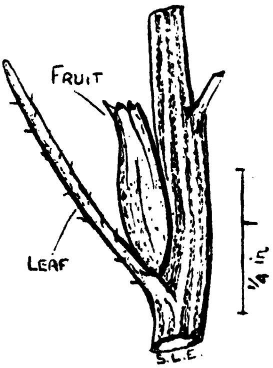


Plate 30.
SODA BUSH.—Part of stem with leaf and fruit.

Hungry sheep affected 4-6 hours after eating soda bush lag behind the mob, then suddenly rush about as if frightened. They develop a rolling gait, the body muscles tremble and face muscles twitch, and they froth at the mouth. Later, the animals go down on their briskets with the head turned over the shoulder as if asleep. Sometimes the head is stretched out with the underside of the neck and lower jaws flat on the ground. Food and liquid are regurgitated through the nose and mouth. Occasionally this fluid is blood-stained. At first, breathing is rapid and forced. Later it becomes slow and almost inperceptible and at this stage the animal is dull and appears to be dazed. Death soon follows. Often, when hungry sheep eat large quantities of this plant just before they go into the brake at night, no symptoms are seen. Next morning affected animals are found dead in the attitude of sleep.

Sometimes, a few straggling deaths take place at any time up to a week after the sheep have eaten soda bush. Such sheep appear depressed and show marked scouring. The dung is dark-coloured.

Post Mortem: On post mortem most affected sheep showed marked congestion of the lungs and fourth stomach. Heart vessels and capillaries under the skin were engorged and some haemorrhages were present under the epicardium. Kidneys were also congested in some sheep and in some the lungs showed pneumonia due to fluid material from the mouth entering the trachea and reaching the lungs.‡ In cases where deaths are delayed, post-mortem examination shows inflammation of the fourth stomach, large intestine and small intestine and blood-stained faeces.§

Prevention: Sheep in the paddock do not like the plant and rarely eat enough to cause trouble. Nearly all deaths have been in hungry travelling sheep which have come suddenly upon the succulent herbage and eaten large quantities. Animals unloaded from railway trucks after long journeys are particularly susceptible. If there is much soda bush on the route to be travelled, such sheep should be given a quantity of hay or other feed before they are put on to the weed.

Treatment: Sheep which go down early should be given an injection of calcium borogluconate solution (see the first part of this series). Travelling mobs should be rested for a few days.

§ Moule, G. R.; personal communication.

Mint Weed.

Other Common Names: Wild mint, narrow-leaved sage.

Botanical Name: *Salvia reflexa* Hornem.

Description: Annual herb, generally 1-2 ft. high, often smaller; stems angular; leaves opposite, bluish-green, narrow, 1-2½ in. long; flowers in opposite pairs or clusters of three or four arranged in spikes at the ends of the branches; calyx ribbed; "petals" blue, about ⅓ in. long, 2-lipped, the lower lip twice as long as the upper; fruit of four small nuts at the bottom of the calyx-tube. (See Plate 31.)

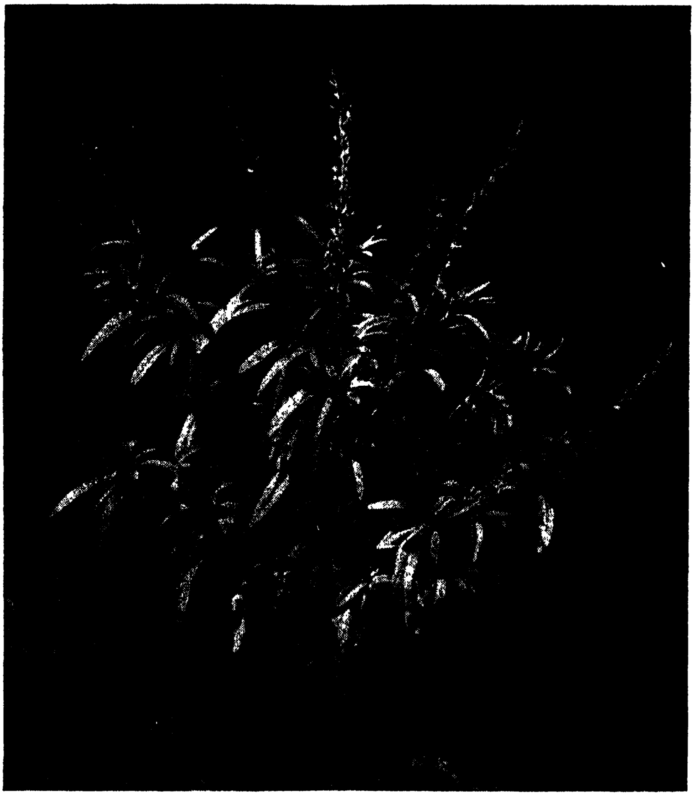


Plate 31.
MINT WEED.

Distribution: The plant is native to North America. In Queensland it is a naturalized weed on the Darling Downs and in the Springsure, Clermont and Tara districts. It has been found at the head of Aramac Creek and in the St. George district and recently has made its appearance in the Moreton district. It thrives on the richest soils.

Seasonal Occurrence: The plant grows profusely after spring rains. It persists right through the summer, though very hot, dry weather will cause it to die off quickly. It is killed by frost.

Evidence of Poisoning:

(*a*) Field: In Queensland, several cases are recorded where deaths of sheep and cattle were attributed to this plant.

(*b*) Feeding tests: Feeding tests both in New South Wales and Queensland have given positive results. These showed that 2 lb. of dried leaves and small stalks were sufficient to kill sheep and young cattle within three days.

(*c*) Chemical: The poisonous principle is potassium nitrate.* In the animal, this is converted to nitrate, causing methaemo-globinaemia (a condition in which the blood cannot take up oxygen).

Symptoms: Animals affected show no symptoms for a while, then they stand apart, breathing rapidly. There is twitching of the muscles and the animal soon goes down. If touched, the animals twitch violently but are unable to rise. Death follows after a few hours. The tongue and mucous membranes become bluish.

Post Mortem: On post mortem, the lungs are sometimes discoloured, sometimes normal except for slight engorgement. The liver and kidneys are congested and the blood chocolate coloured.

Prevention: Sheep eat this plant only if very hungry and the best way of avoiding trouble is to keep them as full as possible. On some narrow stock routes which carry little else but mint weed it may be advisable to give the sheep a small supplementary feed.

Treatment: Sheep usually recover if given one or two injections of methylene blue solution (see the first part of this series).

Wild Sunflower.

Other Common Names: Crownbeard, American dogweed.

Botanical Name: *Verbesina encelioides* Benth. & Hook.

Description: Rough, much-branched annual, usually 3-5 ft. high, densely clothed with white hairs; leaves opposite in lower part of stem, often alternate in upper part, roughly delta-shaped, edges toothed, leaf-stalk broadened at the base into a pair of leaf-like expansions; flowers in heads like small sunflowers, 1-2 in. across, bright yellow in outer part, dark yellow in centre. (See Plates 32 and 33.)

Distribution: The plant is a native of America. In Queensland it is plentiful in the Lockyer, Darling Downs and Maranoa districts and has been found as far north as Blackall. It generally favours sandy or silty soils, especially on stock routes and in roadside ditches and silt banks. It also grows profusely in some ringbarked brigalow and belah country on the western Darling Downs.

Seasonal Occurrence: The plants grow rapidly after spring and summer rains and die out in winter.

Evidence of Poisoning:

(*a*) Field: There is a difference of opinion among graziers as to whether wild sunflower is poisonous or not, but several cases are on

* Williams, C. H., and Hines, H. J. G.: *Aust. Vet. Journ.*, Vol. 16, pp. 14-20, 1940.

record where it is reasonably certain that it was the cause of death. Though most deaths have been with poor travelling sheep, trouble has also been experienced with paddock sheep in good condition.

Plate 32.
WILD SUNFLOWER.

(*b*) Feeding tests: In New South Wales, feeding tests showed that 8 oz. of fresh stems and leaves would kill sheep in from 16 to 36 hours. The same amount of dry plant caused death in 24 hours. At Yeerongpilly, feeding tests were conducted with young leaves only, a sheep consuming 37½ lb. over a period of 39 days without ill effect.

(*c*) Chemical: The stems have been found to contain nitrate but the leaves are apparently free from it. The symptoms are not those of

Plate 33.
INFLORESCENCE AND LEAF OF WILD SUNFLOWER.

nitrate poisoning. It has also been suggested that the plant may contain a cardiac glycoside. Though the actual poisonous principle is not yet known, it is possible that it is present in the stems but not in the leaves. This would explain the discrepancy between the results of feeding tests in New South Wales and Queensland and might also account for the difference of opinion among graziers.

Symptoms: In the field, animals are usually found dead. In the New South Wales feeding tests, animals became dull and listless, with respiration slightly accelerated and shallow.

Post Mortem: The main appearance is reported to be that of pneumonia, with acute congestion of the lungs and pleuritic effusions.

Prevention: Although some graziers state that the plant may be grazed safely by paddock sheep, others maintain it is dangerous to all sheep. It is advisable to avoid turning hungry sheep on to large patches of the plant, especially if they are travelling.

Sunflower Daisy.

Other Common Names: Yellow daisy, wild daisy.

Botanical Name: *Wedelia asperrima* Benth.

Description: Annual herb up 2 ft. high, very rough to the touch: leaves opposite, usually toothed on the edges, about 2 in. long; flower heads on long stalks, like small yellow sunflowers about 1 in. across; seed-heads containing dark brown seeds. (See Plate 34.)

Distribution: The plant is fairly common on heavy soils about Hughenden, Richmond and Julia Creek. It also extends to the Gulf country and the Northern Territory.

Seasonal Occurrence: Sunflower daisy comes up thickly after summer rains and persists through to early winter.

Evidence of Poisoning:

(*a*) Field: Several cases of pneumonia in rams untrucked at sidings along the Great Northern railway were ascribed to eating this plant.

(*b*) Feeding tests: At Townsville, seeds, leaves and fine stems of mature plants were fed to sheep and goats. One sheep died 18 hours after receiving 3½ oz. of the plant. A goat given 4 oz. one day and 5 oz. the next died on the morning of the third day. Three sheep died in less than 24 hours after receiving watery extracts from ¼ to ½ lb. of the chaffed plant.*

(*c*) Chemical: No work on the nature of the poisonous principle has been reported.

* Mulhearn, C. R.: *Queensland Agricultural Journal*, Vol. 52, pp. 397-400, 1939.

Symptoms: In typical cases* affected animals stood with drooped head and ears. Quivering and spasms of the muscles followed, giving the animal a stiff-legged appearance. Later, the animal went down and showed marked muscular spasms as evidenced by uncontrolled leg

Plate 34.

SUNFLOWER DAISY.—*Dried specimen.*

movements and champing of the jaws. Respiratory distress was also noted. Death occurred about half an hour after going down. A quantity of blood-stained fluid issued from the nose a short time after death.

* Mulhearn, C. R.: *Queensland Agricultural Journal*, Vol. 52, pp. 397-400, 1939.

Post Mortem: Severe inflammation of the fourth stomach and the first portion of the small intestine is reported on post mortem.* A quantity of straw-coloured fluid containing jelly-like clots is present in the abdominal cavity and the chest cavity. There is congestion of the lungs, varying in degree in different animals.

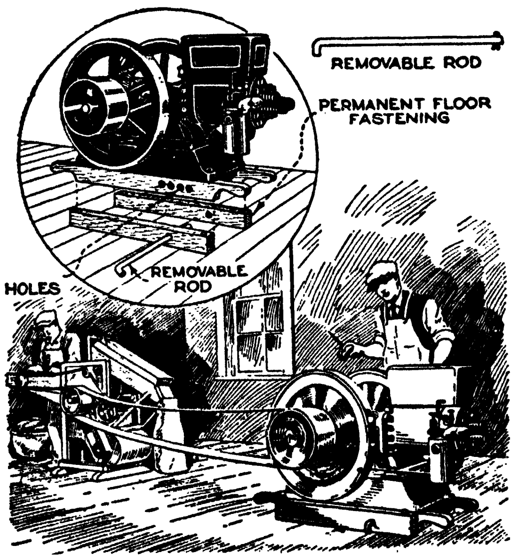
Prevention: Paddock sheep either ignore the plant or eat insufficient to cause death. All mortalities recorded have been among travelling sheep, mostly rams unloaded from railway trucks on to reserves or stock routes or even into paddocks containing this plant. Sheep should not be unloaded from railway trucks on to patches of sunflower daisy.

* Mulhearn, C. R.: *Queensland Agricultural Journal*, Vol. 52, pp. 397-400, 1939.

[TO BE CONTINUED.]

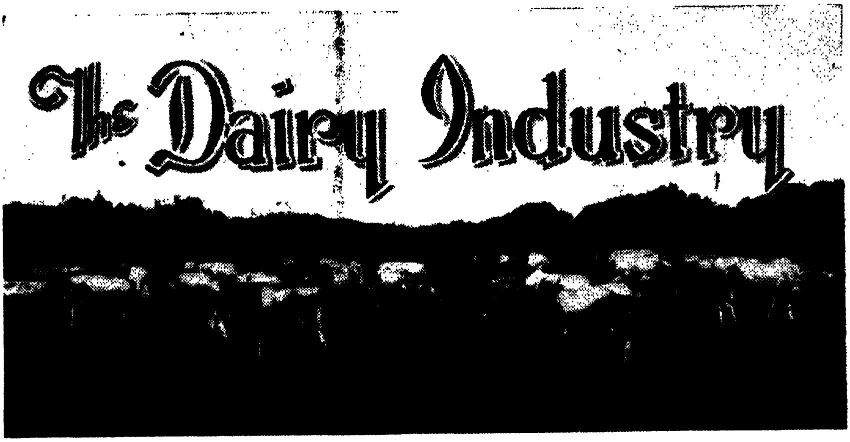
THE FARM ENGINE—ADJUSTABLE BASE.

The problem of holding down an engine without resorting to the usual method of bolting it to the floor is solved by this portable and adjustable base. Two heavy wooden beams are bolted to the underside of the engine, their ends projecting



far enough to be used as handles. Two similar beams, somewhat shorter, are permanently attached to the floor so that those on the engine will fit between them. A removable rod is then pushed through the holes drilled in all four beams, to lock them together and hold the engine down securely. One hole is drilled through each outside beam and a series of holes through the inner ones so that the two base members can be locked together at different points, to obtain proper belt tension. Floor beams of the same type are attached near every engine-driven machine so that, to attach the engine, it is only necessary to slide it into place and slip in the rod.

—*From "Handy Farm and Home Devices and How to Make Them."*



Hot Weather and Milk Quality.

V. R. SMYTHE, Assistant Dairy Technologist.

DURING periods of changeable weather (from cool to hot and *vice versa*) it is interesting to observe the quality of the milk coming in for the city trade, and how it fluctuates with each change of temperature. As soon as the weather becomes warmer in its advance to summer temperatures the quality of fresh milk goes off and more trouble is expected by the people concerned with the maintenance of milk quality. As an example, showing just how much lowering in quality occurs in summer as compared with winter, take the years 1942-43-44 when the mean percentage of milks with methylene blue tests below the standard of 4 hours was 6·5 for the month of June, i.e., during cool weather. But for the month of January, midsummer, this percentage rose to 60·5—almost 10 times as great. Such an increase cannot be attributable to any cause other than increased temperatures. The important thing is that the farmer does not necessarily change his methods of production, but the conditions of production are altered for him during hot weather, and if he is not aware of what is going on there can be plenty of trouble in store for him too.

It is important to remember that increased air temperature affects milk quality in a number of ways. Firstly, higher temperatures favour the development of micro-organisms in the dairy. They grow abundantly on all surfaces where there is any moisture—on buckets, cans, vats, in pipes lines, in teat cups, or on milkers' hands—and unless killed these bacteria will contaminate milk from these sources and continue to grow in the milk, causing quality to decline. Then, secondly, warm weather means that the cooling of milk is done entirely with water which, at best, is only slightly below atmospheric temperature. Consequently, on summer days it is impossible to cool milk to a temperature sufficiently low to prevent the onset of bacterial spoilage.

High air temperatures affect milk quality in another way, and this occurs during transport and storage. Any deterioration happening during transport or storage is increased as air temperature increases, and as the period of transit increases with heavier summer loads.

Water Cooling Systems.

The cooling of milk with water is done, in the case of the "washboard" type of cooler, by circulating water through the interior of coils while the warm milk flows over the outside. With the "beehive" type of cooler, the water remains stationary. Such cooling, in summer, does very little more than remove the body heat from the milk, but this, nevertheless, is necessary and therefore very important. There is one unbreakable rule in milk cooling and this is that the cooling must be done immediately after the milk is drawn from the cow. Shock cooling is what is really necessary.

Several devices are used to lower the temperature of the water for cooling. Water pumped from an underground concrete tank by power from the dairy engine during milking is usually quite cool. With other methods the evaporation principle is applied, as with the ordinary canvas water-bag, to cool water. Originally a large canvas bag left hanging in a shady, breezy spot between milkings was used, but water capacity of this type is obviously very limited. A vast improvement on the bag idea is the cooling tower. Many of these have been installed recently, notably in the Beaudesert district. The water trickles over the tower and is cooled by evaporation. Technically, the cooling efficiency depends on the difference between the wet- and dry-bulb temperature readings. The temperature, of course, cannot be lowered below that of the wet bulb. In near-coastal areas, where the relative humidity is generally low, the wet-bulb temperature reading is usually considerably below ordinary air temperatures, and in those localities the tower cooler works well.

However, while all these devices for cooling water, which is used in turn to cool milk, are useful and helpful they are not quite adequate to ensure that spoilage does not occur.

Milk Deterioration.

Just how necessary cooling is may be seen from tabulated results (see table below) which show how very rapidly milk deteriorates when it is not cooled. These results were obtained by experiment on fresh farm milks.

EFFECT OF STORAGE TEMPERATURE ON METHYLENE BLUE TEST OF FRESH FARM MILKS TWO HOURS OLD.

Storage Temperature.	Deterioration Gradient (decrease in the reduction time for every ½ hour increase in storage time up to 5 hours).
°F.	Minutes.
41	-2.2
50	0
59	2.0
68	8.2
77	13.3
86	19.9
95	23.4

A large number of milks were sampled and stored at various temperatures from 40 deg. to 95 deg. for five hours. That is, all temperatures from cold to hot were represented. The test used to determine the quality of the milk was the methylene blue test. It was found that when the temperature was 60 deg., or below, practically *no* spoilage of the milk occurred. When the temperature was over 60 deg., however, spoilage did occur, and the amount of spoilage increased as the

temperature increased. Here is one example: When the temperature was 86 deg., as it often is on a Queensland summer day, the methylene blue test fell off by almost *20 minutes* for each *half hour* it was held at that temperature. *These were fresh milks, no more than two hours old when tested.*

So that the old idea, that a freshly drawn milk, cleanly produced, will stand transport or short storage without deteriorating is quite wrong. In fact, good quality farm milks show a slightly faster rate of deterioration than poor quality milks. This may sound anomalous, but it is true nevertheless, although the difference is slight.

Several points must be obvious from this. Milk must be cooled to as low a temperature as possible immediately after milking and, further, it must be handled as quickly as possible, so that it arrives at the depôt before it has time to lose quality.

Bacteria in Milk.

P. McCALLUM, Dairy Officer.

A GREATLY increased demand for milk in recent years has placed a greater emphasis on quality, both by the distributors and the consuming public. Moreover, as public health standards, particularly in relation to bottled pasteurized milk, require milk to comply with rigid standards, milk processors are ever on the alert to see that their product meets the requirements of the Health and Dairy Produce Acts.

In recent years there has been a big change over by many dairymen from cream to milk production, and farmers have had to become conversant with many milk-quality tests such as the sediment test and the methylene blue test. However, milk may comply with these tests but still be unsatisfactory for the pasteurized milk trade. For this trade milk must have what is known as good "pasteurizability"; that is, the bacterial flora must be capable of being reduced to low numbers. Milk of good quality usually possesses good "pasteurizability." Poor quality milk often contains high numbers of heat resistant organisms, which survive pasteurization, and thus has poor "pasteurizability."

High bacterial counts in milk after efficient pasteurization are due to thermoduric and thermophilic bacteria. Added interest in these bacteria has occurred in recent years, and it is hoped that the following remarks will assist milk producers in understanding their relation to milk quality

Thermoduric bacteria are heat-resisting micro-organisms—that is, they are not readily destroyed by heat—and about 90 per cent. survive ordinary pasteurization temperatures, but do not grow at such high temperatures. *Thermophilic* bacteria are heat-loving micro-organisms which actually grow or multiply at pasteurization temperatures. Thermoduric and thermophilic bacteria, while not dangerous in themselves or harmful to mankind, are nevertheless an index of some flaw in production methods, and their presence cannot be ignored. In high numbers in a producer's milk they point conclusively to some flaw in production technique—most often improperly cleansed and sterilized equipment.

The following are some of the common sources of contamination of milk by heat-resistant and heat-loving bacteria:—

1. Milking machines which are improperly cleansed and sterilized, especially if there is milkstone or corrosion on any part of the plant caused by improper cleansing methods.—It is surprising how many users of milking machines fail to carry out the correct cleansing technique. Most manufacturers supply with each machine sold a cleansing methods chart, which is usually tacked up on the wall of the milking shed, but many producers are unaware of the instructions thereon. After use, the machine should be first flushed with cold water, then with hot caustic soda (or other cleanser) solution, and finally with clean *boiling* water. Where a steam sterilizer is installed, the plant should be finally sterilized by steam. Corrosion is sometimes caused by using unsuitable well or bore water, and dairymen should endeavour to make provision for an adequate supply of rain water at the milking shed.

2. Old and pitted rubbers.—The remedial measures in this case are self evident.

3. Improperly cleansed coolers, cans, buckets, strainers, &c.—Particular emphasis must be placed on the milk cans as a possible source of contamination. Cans must be thoroughly clean and free from dents, rust spots, milkstone, open seams, &c. Milk is in contact with the can for a longer period than any other piece of equipment on the farm, and where milk is held overnight this may be up to 16 or 18 hours. Therefore, if the can is contaminated in the first place, a heavy build-up of bacteria takes place by the time the milk reaches the depot. Factory can-washing can hardly supersede the individual washing and sterilizing that should be carried out on the farm. Cans should be washed and sterilized immediately they are returned from the factory or depot and, before use, flushed out with a chlorine sterilizing solution. In some cases, higher counts of heat-resistant bacteria are found in the morning's milk than in the night's milk. This usually points to the "lick and a promise" clean-up after the evening milking, as practised by some producers.

It must be understood that the term "heat-resistant" is relative, for though heat-resistant bacteria withstand pasteurizing temperatures they are killed at boiling point unless they are capable of forming spores. They are susceptible also to chemical sterilizers such as chlorine. The important point is that they are not found on utensils properly cared for and properly cleansed and sterilized.

Control methods on the farm can be summarized as follows:—

1. Check all equipment for the presence of milkstone or corrosion and, if present, see that it is removed.

2. Meticulously carry out the cleansing and scalding methods at all times.

3. Before use, flush *all* utensils (machines, &c.) with a cold chlorine rinse. This rinse can then be used as an udder-wash, which not only reduces milk contamination but helps to keep down udder troubles, such as mastitis.

4. Cool all milk quickly and keep at as low a temperature as possible.

5. Reduce dust contamination as much as possible, particularly during milking operations.

6. Milk for the pasteurized trade should be delivered, if possible, twice daily with early and rapid delivery.

Because large sums of money are spent in advertising the food and health values of milk, producers are under an obligation to supply milk of the best quality. Only carefully produced milk deserves such favourable publicity.

Technical Assistance to the Cheese Industry.

IN his report for the year ended June 30th, 1946, the Director of Dairying (Mr. E. B. Rice) set out the following technical services which had been rendered by the Department to the cheese industry during the year. During the 12 months field officers made 130 visits to cheese factories, carried out 15,000 tests on milk supplies and factory processes, and visited hundreds of farms in connection with advisory work.

Bacteriophage Studies.

Starter failures due to bacteriophage continue to be a problem of cheese manufacture. Field officers have visited factories which have experienced slow vats and have recommended the following procedure in endeavouring to minimise "phage" infection:—

(*a*) Propagation of bulk starter in starter cabinets, preferably isolated from the cheesemaking room; starter cans to be fitted with "water-seal" lids.

(*b*) Rotation of starters daily, using several strains the phage for each of which is strain-specific and thus minimising the building-up of phage in the factory equipment.

(*c*) Intensive chlorination of factory equipment prior to use each day.

(*d*) Effective heating of whey.

An experimental isolated starter room erected at Yargullen factory is giving promising results in propagating single-strain starter free from phage infection. After some difficulty experienced in maintaining the temperature of this room in the hot weather, the ventilation system was modified with satisfactory results.

Mite Control.

Mite infestation of some cheese-holding rooms assumed serious proportions in the past year. Control measures so far tried have centred round improved curing-room hygiene, coupled with fumigation with formalin, sulphur, and ammonia. It is hoped to be able to carry out tests using dichlorethyl ether, which has recently been reported on favourably as an acaricide by New Zealand investigators.

Waxed Cheese.

Although waxing of cheese intended for export to Britain is not permitted under the terms of the Imperial contract, some cheese factories are still waxing cheese sold on the local market. Observations at factories

during the year indicated the desirability of a pre-drying period before waxing, and that waxed cheese requires holding in rooms the temperature and humidity of which are adequately controlled.

Milk Renovation.

Trials on partially reducing the acidity of milk of high acidity prior to pasteurization resulted in the production of cheese which was officially classified as first grade, while the unneutralized milk produced cheese of low second grade. The raising of cheese quality must, however, be approached primarily from the angle of improving the quality of milk rather than by attempting to renovate inferior milk, which can at best produce only a bare first-grade cheese.

Cheese Transport.

During last summer it was found that much of the cheese arriving in Brisbane from country factories was in an unsatisfactory condition when the wagons were opened up. At the request of the Cheese Board this problem was given much consideration and a report was subsequently made in which several recommendations were made. Despite the proper icing of the wagons before leaving Brisbane, it was easily shown by calculation that very little if any cooling of the cheese would result after loading at the factory. The loading of approximately 6 tons of uncooled cheese is far beyond the refrigeration available, as represented by the cool air of the wagon and the remaining unmelted ice combined. There is no easy solution of this problem, as the wagon is charged to capacity with ice and it is not possible to renew this at cheese factories, as no ice supplies are generally available locally. In any case, the time factor is against any effective cooling during transit, and, such being the case, deterioration in quality is very likely as control of both cheese temperature and the air humidity within the wagon is indeterminate. The logical conclusion was that the only satisfactory technique would be the proper cooling of cheese before leaving factories by the use of, preferably, air conditioning. With proper self-contained air-conditioning units, efficient control is easily practicable, the only difficulty being the installation costs. As a result, an alternative method using only standardized refrigeration equipment is being considered and it is hoped that, with proper technique, reasonably accurate control of humidity will also be obtained. Full arrangements have been made with the Irongate Co-operative Dairy Association to enable a proper investigation of this technique during the summer season.

Cheese from Homogenised Milk.

The investigations on the manufacture of cheese from homogenised milk were brought to a conclusion. Modifications in plant layout and treatment have simplified the technique. The following are comments by the Australian Dairy Produce Controller (Mr. C. Sheehy) on a sample examined by him in London during his recent visit to Britain:—

> "It was to my way of thinking as fine a flavoured cheese as ever I tasted. Messrs. J. Howey (Victoria) and A. Tuohy (London Manager, Australian Dairy Produce Board), who were with me when it was opened, were greatly impressed by its quality, which they agreed was delicious. You will be glad to know that there was only one tiny trace of fat on the outer paper, whilst the parchment wrapping also indicated a similarly small leakage of fat

for a cheese that had come from Australia to England through the tropics by way of ordinary parcel post. It was truly an amazing achievement, as the cheese on arrival was in every way in as good condition as one would expect to find associated with a similar cheese marketed locally in the ordinary way."

This product, which does not exude fat at temperatures over 100 deg. Fahr., is expected to prove very acceptable under tropical and sub-tropical conditions. The cheese matures much faster than ordinary cheddar cheese, yield of cheese per pound butterfat is higher, and fat losses in the whey are lower. The Queensland Butter Board has assisted materially in these investigations by way of the purchase of any necessary factory equipment, while the directorate and staff of the South Burnett Co-operative Dairy Association have placed every facility at the disposal of departmental officers responsible for the investigations. In conjunction with the Council for Scientific and Industrial Research and the Queensland Butter Board, attention is now being given to developing a method of improved packing of this product. The aim is to pack a consumer-size square package with special transparent covering.

Further observations on the addition of calcium chloride at the rate of 2 oz. per 100 gallons to milk pasteurized for cheesemaking have indicated its beneficial influence when milk of low casein and solids-not-fat content is being dealt with during periods of dry weather.

With a view to ascertaining if the physical condition of cheese might be improved, investigations were carried out in manufacturing cheese in accordance with a system recently reported to be successful in America. The main departure from normal procedure is in the low acidity developed at various stages of manufacture. The practicability of the method under Queensland conditions was demonstrated.

A STRAINER WHICH LASTS LONGER.

The wire gauze commonly used in farm milk strainers has been in short supply for some time, and, consequently, in many strainers it is in such poor repair as to make efficient straining impracticable.

The elimination of the gauze and its replacement by a flat, perforated, tinned-steel or stainless-steel disc is equally as effective in straining milk as the gauze, and the disc lasts longer and is more easily cleaned. The strainer is assembled in the usual way—the convex, perforated disc on top, then the cotton wool filter pad, and the flat, perforated disc on the bottom. The perforations in the flat disc should be somewhat smaller and more numerous than those in the convex disc. Although sturdier and more hygienic than gauze, the steel disc is of no use for straining milk without the cotton wool filter pad. This, however, is in no way a disadvantage, as it guards against the temptation to omit the filter pad and partly strain milk by using only the gauze.

—H. W. JENYNS, Dairy Officer.

ANIMAL HEALTH

Contagious Pneumonia and Paratyphoid of Pigs.

A. K. SUTHERLAND, Veterinary Officer, Animal Health Station, Yeerongpilly.

CONTAGIOUS pneumonia is one of the commonest diseases of pigs in Queensland. It is caused by a specific bacterium, *Salmonella cholerae suis* (sometimes called *S. suipestifer* or *Bacillus suipestifer*). This organism may cause three types of clinical symptoms in pigs, namely, paratyphoid, necrotic enteritis and contagious pneumonia.

When the disease runs an acute (septicaemic) course, it is called paratyphoid; when the bowel is the principal site of lesions it is known as necrotic enteritis; and when pneumonic symptoms are shown it is contagious pneumonia. Thus it is important to remember that the one organism may cause three types of disease.

Contagious pneumonia and paratyphoid are very common in pigs 3 to 4 months of age. In Queensland, necrotic enteritis is rare, but mild lesions of the bowel are often present in cases in which pneumonia is the principal manifestation of the infection.

Economic Loss.

Many pigs may die during an outbreak of paratyphoid, particularly in large fattening establishments.

Contagious pneumonia also causes many deaths, and pigs which recover are often unthrifty or worthless. When the disease appears in pigs near market weight, some fatteners attempt to reduce their loss by forwarding the whole of the affected mob for slaughter; in such cases, there are often many deaths en route to the bacon factory and in the yards while awaiting slaughter. Furthermore, many carcases from such a mob may be condemned for paratyphoid, fever or septicaemia.

The aggregate financial loss from contagious pneumonia and paratyphoid is obviously heavy, because both these diseases are prevalent throughout the pig raising districts of Queensland.

Symptoms.

Paratyphoid.—Serious symptoms may develop in a few hours. There is marked dullness and no inclination to move even when hunted. Appetite is lost, but there may be considerable thirst. There is fever (temperature 104° to 107°) with a red or purplish discoloration of the skin of the belly. Death occurs within a few hours or a few days. Often pigs are simply found dead without having been observed sick.

Post mortem examination may reveal little to the unskilled observer. The blood vessels of the carcase are often congested. Lymph nodes throughout the body are usually swollen, juicy, and dark reddish purple,

with many pin-point hæmorrhages in their interior. Quite frequently there are pin-point hæmorrhages beneath the capsule of the kidney. The spleen may be somewhat soft and slightly enlarged. The lungs are usually dark red and the early stages of pneumonia, as described in the next section, may be present.

Contagious Pneumonia.—The main symptoms in this form of the disease are fever and pneumonia. Affected pigs are dull and disinclined to move. They are usually thirsty, but have poor appetites. There is a cough, rapid, shallow breathing and a thick discharge from the eyes and nose. The pigs lose weight rapidly and become very weak and may stagger. Death may occur in one to two weeks after the appearance of the symptoms.

Less severe cases of pneumonia may recover, particularly if well fed and cared for, but more often they remain unthrifty. Animals which recover may eat so much feed before they are marketed that they are unprofitable by the time they are ready for the meat works.

Post mortem examination shows marked lesions (pneumonia) in the lungs. The lung tissue has lost its normal salmon-pink colour and spongy texture. It is firmer than normal and does not float in water. The colour varies from dark red to light grey. There may be an excessive amount of fluid in the chest cavity and in the sac surrounding the heart. The lungs may adhere to the chest wall by fibrous strands, and within the lung tissue there are usually many small abscesses containing greyish-yellow pus. Those who are familiar with meat inspection will observe that the bronchial lymph nodes are swollen and juicy.

Changes similar to those seen in paratyphoid may occur in other organs.

Necrotic Enteritis.—In the early stages there is fever, loss of appetite and dullness. Diarrhœa soon appears and the pig loses weight rapidly. Some pigs become very weak and die from one to several weeks after the appearance of symptoms; others make a gradual recovery, but fatten slowly.

Post mortem examination reveals lesions in the intestine usually in the cæcum or blind gut and adjacent parts of the large bowel. The wall of the bowel is thickened; its internal lining is reddened and congested, and may be ulcerated or covered with either large patches or many small "buttons" of brown, grey or yellow scab-like material.

Sources of Infection.

Pigs which recover either completely or partially from any form of the disease may harbour Salmonella bacteria for long periods. Such animals are called "carriers". They discharge infective material in their dung or urine or in sputum coughed up from the lungs. Salmonella infection is so common among pigs that "carriers" are always likely to be present in a batch of purchased stores. Thus breeders should avoid purchasing pigs if there are any in the batch with a cough or diarrhœa. Likewise, they should avoid buying from herds in which these symptoms are evident.

The Salmonella bacteria are not very hardy and soon die when exposed to sunlight and dryness. Unfortunately, however, many piggeries have moist shaded places in which the micro-organisms can survive for many months. Every batch of pigs housed in sties or yards of this type is exposed to the risk of infection.

Uncooked pork scraps or butchers' offal may introduce contagious pneumonia and other infectious diseases into piggeries, therefore *The Diseases in Stock Act* requires that all offal and garbage fed to pigs shall be thoroughly boiled.

Conditions Which Predispose Pigs to Infection.

A number of factors lower the pigs' resistance to disease.*

Outbreaks of pneumonia and paratyphoid will occasionally occur in herds kept under the best conditions, but these diseases are most troublesome in herds kept in unhygienic quarters. Low lying, muddy or "pig sick" yards, dirty pig wallows, and old wooden sties, which it is impossible to clean or disinfect, all predispose a herd to outbreaks of contagious pneumonia. It will be readily appreciated that when infection is introduced into premises on which insanitary conditions prevail, the yards, troughs and sties soon become loaded with disease germs. Overcrowding also predisposes the herd to infection.

Well fed and rapidly growing pigs have greater resistance to disease than animals suffering from malnutrition. Nevertheless, even strong, well nourished animals may succumb and, in fact, one frequently sees fat pigs which have died from paratyphoid.

Rations which are deficient in protein, with respect to either quantity or quality, or in vitamins, reduce the pig's ability to resist infectious disease. Hence, it is wise to use a well balanced ration. Green feed is particularly important to ensure a supply of vitamins, and if good pasture is not available, then good quality lucerne chaff should be fed.

Herds which are maintained by buying stores are in constant danger of becoming infected through the purchase of "carrier" or diseased pigs.

Diagnosis of Contagious Pneumonia.

When outbreaks of disease occur, pig raisers should consult the nearest veterinary officer or stock inspector to obtain an accurate diagnosis.

Sucking pigs are rarely affected with contagious pneumonia. The harsh dry cough which is often observed in suckers a few weeks old is usually caused by the larvæ of the large roundworm, *Ascaris lumbricoides*, migrating through the lungs.

Swine influenza apparently also occurs in suckers in Queensland. This disease produces pneumonia with cough, a discharge from the eyes and nose and perhaps sneezing.

Pneumonia in weaned pigs is usually contagious pneumonia caused by *Salmonella choleræ suis*.

Diagnosis of Paratyphoid.

This disease often kills quickly and leads the farmer to suspect that the pigs have been poisoned. A short, fatal illness accompanied by reddish purple discoloration of the skin of the belly and the ears, swollen, watery, dark-red or purple lymph glands and tiny hæmorrhages in the kidneys, would lead one to suspect paratyphoid. If the lungs show

* See also A. L. Clay (1946) "Management of Pigs in Relation to Disease Prevention". *Queensland Agricultural Journal*, February, 1946.

some signs of pneumonia, or if there are necrotic ulcers in the blind gut (cæcum), then a diagnosis of paratyphoid is strengthened. Officers of the Department of Agriculture and Stock can submit appropriate specimens to one of the Animal Health Stations for confirmation of their diagnosis.

Swine paratyphoid has to be differentiated from:—

(1) *Nitrite poisoning* in which the characteristic feature is a brownish discoloration of the blood.

(2) *Acute swine erysipelas.* The septicæmic form of erysipelas resembles paratyphoid and laboratory examination is necessary to differentiate the two diseases with certainty. Pneumonia may be present in paratyphoid, but not in erysipelas.

(3) *Arsenical poisoning* produces abdominal pain and diarrhœa and usually results in death fairly quickly. The stomach and intestines are acutely inflamed and hæmorrhagic.

(4) *Swine Fever.*—The disease known in Great Britain as swine fever and in America as hog cholera is similar to paratyphoid. Swine fever does not exist in Australia, but on three (or perhaps four) occasions it has been introduced into this country in imported pigmeats. The last outbreak occurred in 1943 near Sydney, New South Wales, and was quickly stamped out by quarantine and slaughter of affected pigs.

It is important, therefore, that any outbreaks of swine fever be promptly detected and dealt with. The symptoms and post mortem findings in swine fever are similar to those described for paratyphoid, but swine fever should be suspected if the outbreak spreads rapidly through the piggery and has a high death rate. The two diseases can be differentiated only by laboratory tests, so it is necessary to seek competent advice at once, so that appropriate specimens can be submitted to the laboratory.

How to Deal With an Outbreak.

There is no efficient medicinal treatment at present available for contagious pneumonia or paratyphoid. Therefore, to minimize losses when the disease occurs the following action should be taken:—

1. Isolate all sick pigs, preferably by moving the healthy pigs to new quarters. If only one pen on a piggery is affected then the whole of this pen should be held in quarantine and the remainder of the herd removed from contact with them, e.g. by vacating adjoining pens or yards.

2. Destroy seriously affected pigs and burn or bury the carcases.

3. Infected dung and discharges should be dealt with by removing all litter and rubbish from pens and burying it or disposing of it so that it is not accessible to pigs. Troughs, other than of metal or concrete, which cannot be disinfected, should be burned.

4. All wet or muddy places or wallows in pens should be either drained or filled in.

5. Sunlight is an excellent disinfectant. It may be necessary to lift the roofs of sheds and to lop trees to admit sunlight to sties and yards. Chemical disinfectants are not reliable except on clean metal or concrete surfaces, because they do not penetrate into cracks, soil or organic matter to kill germs lodged in such places.

6. All pigs in contact with diseased pigs should be held in quarantine and sold for slaughter as soon as possible.

7. Sows with litters should be strictly isolated to protect them from infection. Weaners should run with others of their own age and *not* with a mixed mob of older pigs in which there are bound to be some carriers.

Prevention.

In herds which are maintained by purchase of stores it is difficult to avoid infection, so they should be worked with this risk in mind.

To prevent infection, it is therefore necessary that the pig raiser breed his own pigs. The breeding stock to establish a disease-free herd should come from a piggery in which there is no evidence of infection. Once a clean herd is established it must be kept clean by avoiding either direct or indirect contact with other piggeries which are possibly infected. If garbage or offal is fed it must be thoroughly boiled.

Pigs showing a cough, discharge from the eyes or nose or diarrhœa are very likely to be carriers of contagious pneumonia or paratyphoid, although they may appear to be in good condition. Unthrifty pigs should never be purchased. Pigs in contact with pigs showing any of these symptoms are also likely to be carriers.

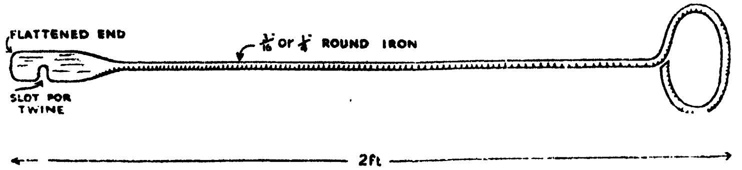
Vaccines for paratyphoid and pneumonia in swine are marketed under a variety of names, e.g. swine plague vaccine, suipestifer vaccine, contagious pneumonia vaccine, but they are not effective in preventing the disease.

It will be apparent from the discussion on predisposing factors that good feeding and sanitation are important. Losses caused by pneumonia and paratyphoid are lowest in herds grazed on well managed pasture and fed in either clean metal or concrete troughs or from clean dry self-feeding hoppers.

DEVICE FOR TYING HAY BALES WITH TWINE.

During the past few years baling wire has become increasingly difficult to obtain, with the result that much of the baled hay crops had to be tied with twine. To meet this position on his stationary hay baler, Mr. J. V. Hardy, who is farming in the Paeroa district, made a device for threading the twine through the bales.

It consists of a rod with a loop forming a handle at one end. The other end was flattened after being heated, and a slot to take twine was cut into one side. The over-all length of the device is about 2 ft.



The twine is placed in the slot, the rod pushed through the compressed hay near one block, and the twine pulled through. The rod is withdrawn and inserted near the next block, where the twine is again placed in the slot and drawn through to the side from which the operation was started. Finally the twine is drawn tight and tied. This operation is carried out for both top and bottom ties, a separate ball of twine being used for each.

The device is simple but effective, and Mr. Hardy has consented to the publication of this note in the hope that it will be helpful to other farmers.—C. Walker, Instructor in Agriculture, Thames (N.Z.), in the *New Zealand Journal of Agriculture.*

Housing of Poultry.

T. HALLICK, Inspector, Poultry Branch.

IN the consideration of housing of poultry, many factors have to be taken into account, location, climatic conditions, suitability and availability of materials, and cost of construction being of major importance.

There has been a tendency in some instances to proceed along lines of housing shown in overseas publications. These, whilst admirably suited for their countries of origin which suffer from severe conditions of wet and cold, may not be as suited to the requirements of our more tropical conditions. Poultry sheds of the log cabin type, totally walled on all sides, have no place in our State, having been designed primarily to conserve heat, whereas the objective in most instances in Queensland is to provide satisfactory shelter from rain and direct winds, whilst still securing the utmost circulation of cool fresh air around the birds. In planning a good poultry house adequate protection to the fowl must be given not only against the most biting of winds, which usually come from a west or south-westerly direction, but also against the summer heat, for excessive cold or heat can seriously affect the egg yield from the flock.

Correct ventilation is essential to disperse the moisture given off by the birds in breathing and from the droppings deposited below the perches. A moist atmosphere conduces to the spread of roup, the greatest of all poultry scourges. The average shed in use in this State, whilst giving plenty of air from the front and over the top of the birds, generally fails to provide any ingress for fresh air below the perches, thereby creating an area of damp, stagnant air under the birds. Provision should therefore always be made for the passage of a current of outside air through the bottom of the back wall, but baffled in such a manner that a direct draught is not set up.

The shed should be designed to utilize to the fullest the valuable properties of sunlight, whilst giving protection from overheating. A high open front facing in the correct direction will permit of the sunshine passing over the whole of the floor space at different times of the day, thereby drying out the droppings and, where the birds are kept intensively, providing a large percentage of "sunshine vitamins" so necessary to their health. A good height of front to the shed will also reduce heat radiation in hot weather, and this can be further controlled by the use of cooling paints upon the roofing material.

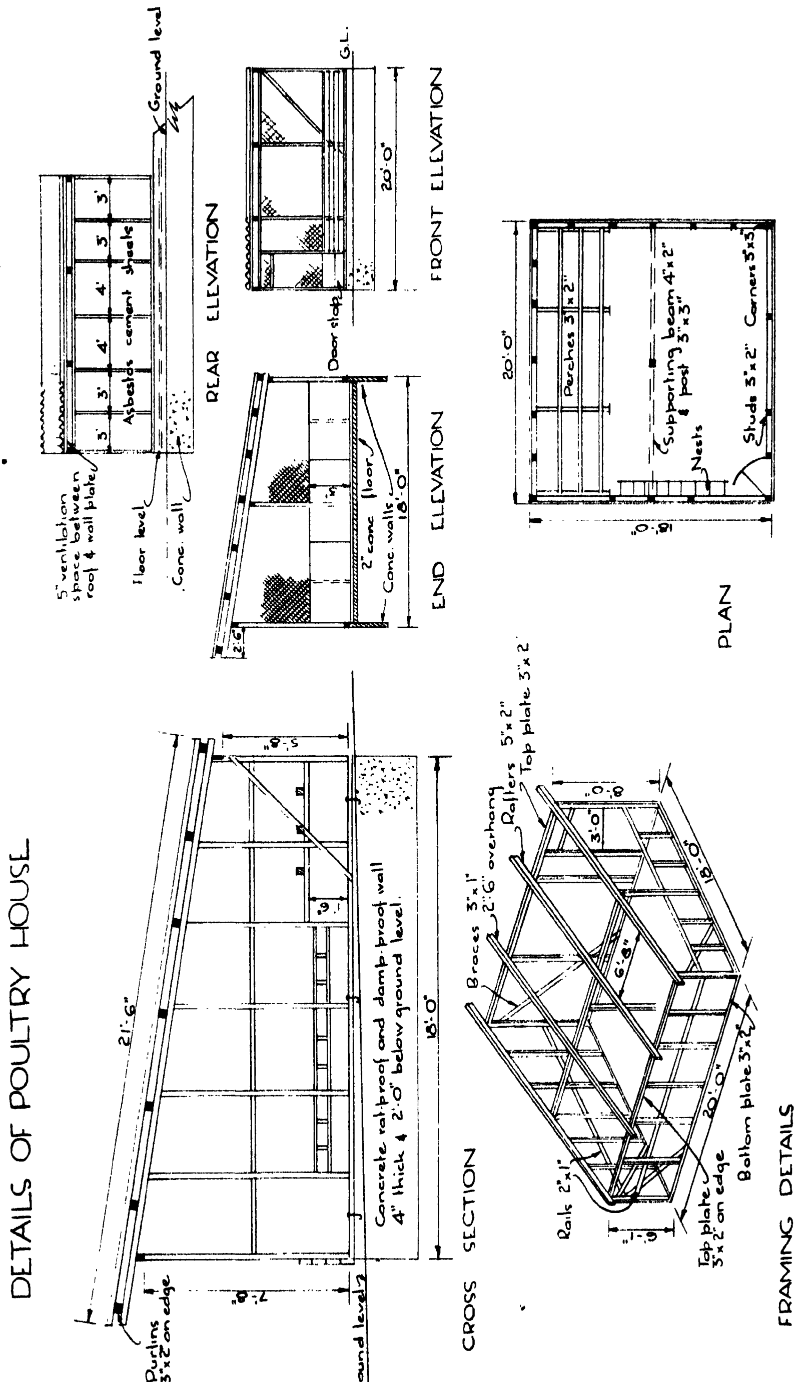

DETAILS OF POULTRY HOUSE
CROSS SECTION
21'-6"
Purlins 3"x 2" on edge
7'-0"
Ground level
5'-8"
18'-0"
1'-6"
Concrete rat-proof and damp-proof wall 4" thick & 2'-0" below ground level.
FRAMING DETAILS
Braces 3"x 1"
2'-6" overhang
Rafters 5"x 2"
Top plate 3"x 2
Rails 2"x 1"
Top plate 3"x 2" on edge
Bottom plate 3"x 2"
20'-0"
18'-0"
8'-0"
3'-0"
6'-8"
6'-1"
REAR ELEVATION
5" ventilation space between roof & wall plate
Floor level
Conc. wall
Asbestos cement sheets
Ground level
END ELEVATION
Door stop
2" conc. floor
Conc. walls
18'-0"
2'-6"
FRONT ELEVATION
20'-0"
G.L.
PLAN
20'-0"
18'-0"
Perches 3"x 2"
Supporting beam 4"x 2" & post 3"x 3"
Nests
Studs 3"x 2"
Corners 3"x 3"

Plate 35.

SITE.

The first point to be considered is the site upon which the housing is to be erected. Whilst practically any aspect or slope may be utilized for poultry keeping, bad gradients or faulty aspect may seriously increase the capital cost of shed installation, due to necessary correction of such faults.

Too severe a slope will necessitate the digging out and hilling up of areas to provide the essential of level floor spaces; alternatively, if wooden floors are utilized, they will have to be placed upon stumps in such a manner that one side of the shed will be greatly above the ground level, and extra labour will be involved in carrying feed, etc., up stairs or ramps. The force of storm waters down a severe slope will also tend to break down any but the best of drains, with resultant flooding of the fowl house floor. A wrong aspect makes it particularly difficult to provide protection from cold winds and driving rain and at the same time give ample open wall space for the admission of the maximum amount of sunlight.

It will be obvious that, if a steep slope with a westerly aspect is chosen, the wall of the house facing the west should be completely closed to protect the birds from driving westerly winds, and the open side of the shed on the east shaded from the morning sun. Conversely, it will be noted that an easterly or north-easterly aspect not only gives the greatest degree of sunlight but also provides some degree of natural protection from the westerly winds. The ideal site is a gentle slope with an easterly, north-easterly, or northerly aspect, and it has been found by experience that the facing of open-fronted sheds towards the north-east gives the greatest degree of protection against driving rains in most localities.

Soil Type.

Poultry farming is successfully carried out on all types of soil, but for semi-intensive housing soil of a sandy nature is preferable, for it preserves the cleanliness of the runs to a great extent, due to the constant disintegration of excreta, as the sandy soil is scratched up by the birds. Soil of a clayey nature tends to harden on the surface during dry spells, and excreta become plastered upon it; in wet weather it "puddles," and miniature cesspools are created from which the birds will drink, to the detriment of their health. Hard rocky soils are not only troublesome for the attendant to work, but also cause cankerous growths upon the feet of the birds due to stone bruises.

TYPES OF HOUSING.

There are three generally accepted practices for poultry housing:—

(1) Intensive,

(2) Semi-intensive (house and yard),

(3) Free or open range.

1. Intensive Housing.

Under this system of housing, the birds are kept entirely under cover in fairly large sheds, and in relatively large numbers. Therefore, strict attention has to be paid to the physical condition of the bird, and to the question of feeding. As the bird has only a very restricted space, 4 sq. ft. per bird being about the correct area, exercise has to be

promoted to ensure the health of the birds. This is done by having scratching material or litter, such as grass, straw, leaves, or chips, strewn over the floor to a depth of 4 to 6 inches, all the grain portion of the ration being scattered in it. This naturally promotes a good deal of scratching on the part of the bird in search of grains that have become covered, and it should be obvious to all poultry raisers that the feeding of the evening grain should not be left until towards the end of the day. Many farmers allow a wide range to their birds, consequently they gather a fair amount of natural food and so do not consume as much feed as birds kept entirely under cover. If at any time poultry breeders keeping birds under such conditions think it desirable to change over to the intensive system, because of the damage done by their poultry to crops, haystacks, or gardens, the question of feeding becomes

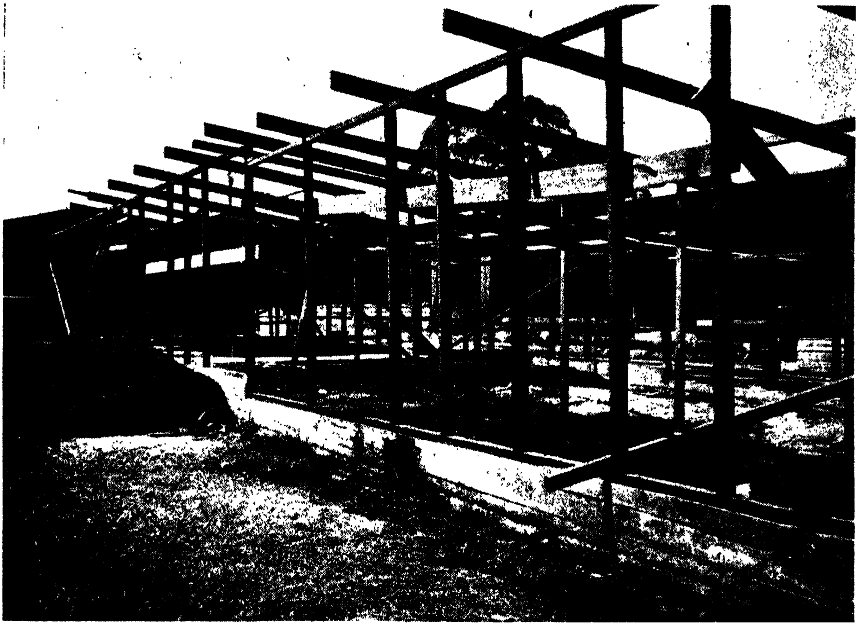


Plate 36.
INTENSIVE POULTRY HOUSE IN COURSE OF CONSTRUCTION.—Note concrete baffle wall to prevent rats making home under floor.

very important; in fact, any person keeping poultry under these conditions must give this matter the utmost consideration, as it is impossible for the birds to procure anything but what they are supplied with. The failure of many poultry farmers to appreciate this point has caused this system of housing to be condemned.

2. Semi-intensive Housing.

This system is merely the addition of small netted yards to the intensive house, thereby increasing the carrying capacity per square foot of housing (only 3 sq. ft. of actual roofing per bird being required). This method cuts down capital cost and may be of value to a beginner who has to quickly bring his flock number to a total sufficient to provide a living income with a minimum outlay of original capital. This method has the

disadvantage of the free range system, inasmuch as the birds are liable to be affected by contact with outside climatic changes, to the probable detriment of health and egg production. Soil contamination is another serious defect; however, on loose sandy soils this is held to a minimum. As with the intensive system, all birds are under control at all times and can be securely fastened at night or when required for attention.

3. Free or Open Range Housing.

On this system, the movement of the fowl is not confined in any way, and although some contamination of soil will be caused it does not become serious because of the unrestricted range and growth of plants.

As only a small shelter shed is provided for roosting purposes, the birds are exposed to the vagaries of the weather, with unstable egg production. The system is hazardous in any district where foxes abound, and losses of over 100 birds in one night have been caused by this pest.

Most Suitable Type of Laying Sheds.

Any type of shed is suitable for housing of poultry, provided the points previously enumerated with regard to provision being made for correct entry of sunlight and adequate ventilation are closely followed, and existing buildings can be adapted along these lines.

The ideal laying shed for Queensland, when ease of management, economic coverage of birds, and greatest use of sunshine is aimed at, is one from 18 to 20 ft. in depth from front to back, with a height of 8 ft. at the front and 6 ft. at the back wall. This shed can be of indefinite length, but if in excess of 20 ft. should be divided into 20 ft. sections; these sections will carry 100 birds if run intensively, or 140 semi-intensively, by the provision of a netted yard of similar dimensions.

Plate 35 shows the cross section of such a shed, which has a veranda commencing just under the rafters in front. This veranda prevents rain beating into the house from the front, and by not extending right to the top of the roof allows a free circulation of air. If desired, the roof may be extended by 3 ft. instead, but in that case the height of the shed in front may be 8 ft. The back wall of the shed should be divided into three sections: a solid wall commencing 12 inches above ground level, and terminating 12 inches below the roof, and 12-inch flaps hinged to top and bottom of this fixed wall. The upper flap, opening upward and outward and hinged to the top batten, will provide a regulated amount of top ventilation, and the lower flap, opening upward and outward, a regulated amount of ventilation below perches. The space below perches should be separated from the general floor space by the provision of 4-inch mesh netting slung immediately below the perches, and extending from the front of the perch to the floor of the shed. In this manner the greater part of the birds' droppings will be prevented from contaminating the scratching litter on the shed floor, and by completely opening the bottom flap of the rear wall can be easily removed for sale, or use in farm cultivation, without any disturbance of the fowls.

Side walls, and the lower front wall, to a height of 2 ft. from floor level, should be of solid material; the balance of the front wall is of wire netting. In intensive sheds the front solid section of wall may be modified by the installation of nest boxes along its upper half, the back of the boxes being accessible from the outside of the shed. If dry mash hoppers are placed upon the front wall above the nest boxes, with water

troughs at ground level on the outside front, and openings in wall for poultry to protrude their heads to obtain a drink, entrance to the shed by the attendant will be reduced to the minimum with a considerable saving in time and labour to the farmer.

If these sheds are used with the semi-intensive system, the yards will have to be placed at the rear of the houses, with trapdoors in the rear walls for passage of fowls; as it is essential, if the maximum benefit is to be obtained from such a shed front layout, that a clear roadway is available along the front of the sheds for passage of vehicles used in feed replenishing operations, and a multiplicity of yard gates will considerably add to the labour of egg collection and other work along the sheds.

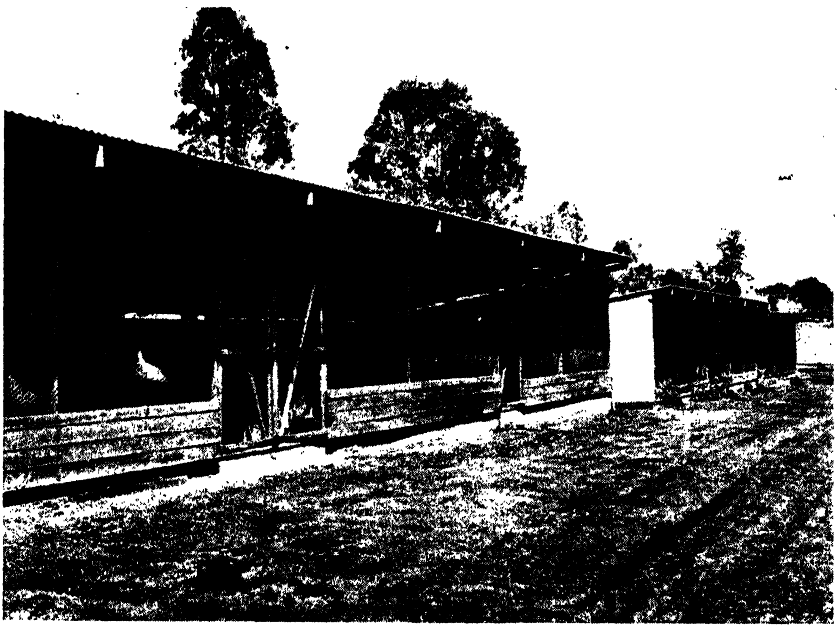


Plate 37.

INTENSIVE LAYING SHEDS COMPLETED.

The most common adaptation of poultry housing met with to-day are the huts removed from Army camps. These huts are generally from 16 to 20 feet wide, and feature in the main a gable roof; when correctly converted they make excellent intensive sheds. If possible the spacing should be increased where the roofing sheets meet at the top of the gable, and provision made for a free passage of air through this section, care being taken to enlarge the ridge capping sufficiently to afford ample protection from driving rain.

The side of shed facing east, north-east, or north should then be modified in accordance with that described for the "lean-to" shed illustrated in Plate 38, and the reverse side can be altered very easily to provide the solid centre wall with flap extensions at top and bottom.

Building Materials.

Any standard type of building material may be used, from cemented hessian to brick and concrete, and the farmer should be guided in his choice by the local conditions of availability and cost.

Cemented hessian is probably the cheapest form of building material, hessian being tightly tacked to the framework of the shed and then coated, whilst wet, with cement. Directions can be obtained from the Department for its correct application, but it is not suitable for roofing, and some more durable and waterproof material must be provided for that section. Whilst cemented hessian will give a cheap and fairly satisfactory job, it is not recommended, as it is very easily damaged and will always be found troublesome at its lower edges, the fowls having a tendency to peck it away from the battens and studs.

Brick and concrete are, of course, ideal when considered from the point of insulation, giving maximum protection from both heat and cold. Their cost, however, generally militates against their use, and they have the decided disadvantage of being permanently positioned, making alterations to plant layout very difficult.

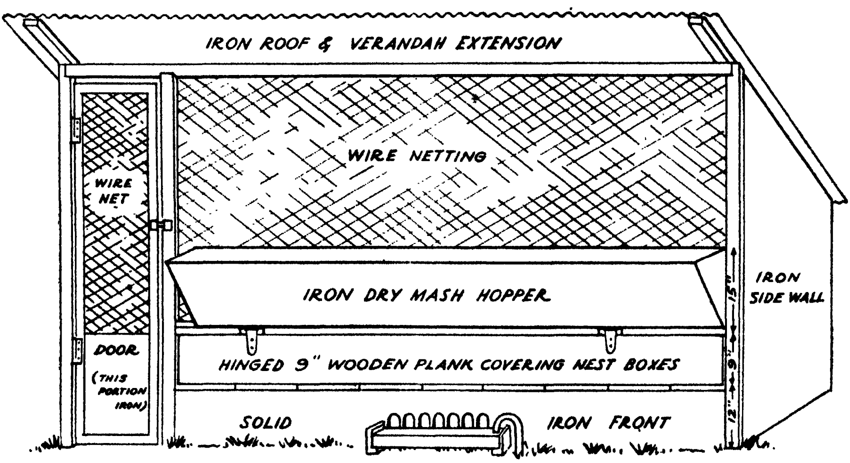


Plate 38.
Front of a fowlhouse, showing floor-level water system with nests and dry-mash hopper above.

Sawn hardwood timber has been used in the southern States successfully for many years, and where used with a wooden roof covered with roofing felt a fair stability of temperature is ensured. Timber buildings, however, have a decided disadvantage in the fact that, unless constantly and effectively treated with deterrent oils or creosote, they are liable to afford harbourage for parasitical vermin of the tick and mite types.

Galvanized iron and asbestos cement sheets are probably the most suitable materials available in this State. Used in conjunction with a sawn hardwood timber framing they combine the virtues of cheapness, easy conveyance to site, minimum labour of erection, clean and sanitary walls with little chance of vermin harbourage, and maximum length of life. They may also be dismantled and re-erected, should it ever be

required, with little loss from damage. Asbestos cement sheets, being naturally white in colour, radiate the heat of the sun, and do not become excessively hot, but galvanized iron can be improved by painting with one of the cooling paints prepared for this purpose.

Floors.

It is essential that flooring of poultry sheds should be as hard as possible, for any looseness will be quickly dug into by the birds, thereby making it impossible to completely remove excreta from sheds without removal also of portion of the floor surface. For this reason earthen floors are generally unsatisfactory, although a fair degree of hardness can be obtained with "puddled" clay. Cracks and crevices will eventually appear in any earthen floor, and these become excellent breeding grounds for many types of parasites, such as worms and fleas, as well as propagating the many disease organisms which are passed in the excreta. Nothing can be so dangerous to the health of the fowls as wet or damp earthen floors.

A few years ago a trial was made of the application of bitumen covering over hard-tamped earth floors, but insufficient information is available to enable a definite opinion to be given of its merit; in some known cases, however, it was found that the scratching proclivity of the birds triumphed, and the bitumen was broken up at the wall edges.

Hardwood flooring is satisfactory, and where the sheds are built on a fair to severe slope the most economical in installation; no filling or levelling of ground is required, stumps equalizing varying ground levels. Timber floors are easily cleaned, but must be well treated at regular intervals with oil or creosote to minimise the risk of vermin infection.

Concrete flooring is probably the ideal, giving a perfectly hard, smooth surface, unaffected by scratching and repellant to vermin. It is easy to clean, and can be hosed down if necessary. It is essential, however, that it be perfectly constructed and that the edges of the floor be carried down into the ground all round to a depth of at least 24 inches, otherwise rats will work under the floor, eventually undermining it to such an extent that the surface will crack and break. Concrete flooring shares with concrete and brick sheds the disadvantage of being a fixture; if the shed has to be removed a new floor has to be provided.

Brooder Sheds.

Houses for the brooding of chicks will naturally vary according to the type of brooding equipment installed.

Battery Brooding.

For battery brooding, any well insulated room is suitable, provided it gives ample head room and has sufficient opening windows to supply adequate light for attention to brooders and ventilation to the room. It is not practicable to endeavour to supply direct sunlight to all chicks in an average type of commercial battery brooder, and for this reason there is no necessity to use open fronted sheds, the absence of sunlight being made up to the chicks by fish oil supplements in their diet.

Cold and Hot Brooding.

A shed of similar construction to that detailed for laying hens will be found satisfactory for most other types of brooding, but may be reduced to a depth of from 12 to 15 ft. from front to back; the rear 3 ft.

of floor space should be partitioned off to a height of 2ft. with solid walling, and thence to roof with 1-inch wire netting, to provide a through passage from end to end of shed, and the shed doors placed at the ends of passage.

When cold brooders are used, the shed should be further partitioned into sections 6 ft. wide, running from the front of the shed to the interior passage wall; each of these sections should house a cold brooder of 100-chick capacity.

Where heated brooders are used the spacing between sections will have to be altered to suit the known capacity of the brooder. For instance, oil or electric hover brooders of 300-chick capacity will require the partitions to be approximately 12 ft. apart, the brooder being placed in the centre of the sectional floor.

Brooder House Fronts.

If open wire netting fronts are to be utilized, the lower front should be of solid construction to a height of 3 ft. from the ground, the balance of the front being netted with ½-inch mesh wire, and flaps of iron, timber, or hessian should be provided which can be closed over the open netting front as protection against inclement weather conditions.

The most suitable brooder house front, however, has glass windows substituted for the open netted space. These windows should be hinged in such a manner that, when conditions are favourable, sunshine may pass over the shed floors without contact with the glass windows, for window glass, whilst admitting light, is impervious to the sun's ultra-violet rays, which are particularly beneficial to the chicks. Window glass substitutes, manufactured from stiffened, waterproof fabric materials, do not suffer from this disability, but prove costly, due to their comparatively short life in normal use.

Weaning Sheds.

It is customary to provide an intermediate type of housing for chickens between the ages of 6 weeks and 4 months, to cover the period after leaving the brooders and prior to installation in their permanent laying quarters.

Intensive System.

Where weaning is carried out on the intensive system, sheds of similar type to those described for laying hens should be provided, but the overall measurements may be reduced to a depth of 12 ft., with height of 7 ft. and 5 ft. at front and back respectively. The lower ventilation flap at the back should be reduced to a width of 6 inches, as it will be necessary to have perching ramps installed within 12 inches of the floor for the first few weeks of the chicks' occupation.

Carrier battens should be placed on both side walls of the shed approximately 10 inches from ground level; 3 x 1 inch perches, extending the length of the shed, are placed on these carrier battens (intermediate carrier battens are placed at regular intervals to carry the weight of perches between the two battens on the end walls).

Commencing from the back wall, perches are spaced with intervals of 1 inch; when sufficient perches have been provided, a slatted ramp of the same materials should be extended from the front perch to the floor, at such an angle as to give chicks easy ascent to perches. As chicks become accustomed to sleeping on perches, spacing between perches may be gradually increased.

If chicks are placed in the weaning shed in cold weather, it is advisable to provide a canopy of hessian over the chicks, about 6 inches above the level of the perches. Bottom ventilation of the shed should be used very sparingly for the first month. It is better to have too little or no bottom ventilation than too much, until such time as the chicks are thoroughly hardened off.

The carrying capacity of this shed may be increased to 140 chicks if run semi-intensively, by the addition of netted runs.

Free and Open Range.

Where chicks can be reared under free range conditions, or in very large netted runs, they may be housed in units of 50, in sheds 10 ft. x 10 ft., 6 ft. high at the front and 4 ft. at the back. These sheds can be made with slatted wood floors of 3 x 1 timber, placed 12 inches from ground level. As with the batten system of perching, described for the intensive sheds, these floor battens should be movable, and from an original spacing of 1 inch apart they are gradually increased to the spacing of 12 inches apart, this flooring then becoming the orthodox type of perching.

Night Arks.

Night arks, which are very popular in England, are a simple and inexpensive modification of the foregoing shed.

Two light frame walls, covered with iron, asbestos sheeting, or roofing felt, each 6 ft. square, are fastened together at the tops with hinges or wire, and the bottom ends extended from each other to a width of approximately 5 ft. at the base. A slatted floor section frame, covered with 1-inch wire netting, is then inserted on runners placed on either side wall 14 inches from the ground, thus making a triangular shaped canopy shed, with a wire floor 12 inches above the ground. The rear end is closed in with solid material to within 12 inches of the top to form a windbreak, and the front end is wire netted, with a wire netted door. Such arks will carry 25 pullets to 4 months, are economical of manufacture, and can be easily dismantled for removal to a fresh site.

Incubator Rooms.

The requirements of a good incubator room may be summarized as under:—

1. *Good insulation.*—It is desirable that the temperature in the incubator room be maintained as far as possible within the range of 65 to 75 deg. F., and this necessitates the utmost regard for the insulating of the room. Brick or concrete are the ideal materials, with terra-cotta roofing tiles. A good job can be made, however, with asbestos cement or sawn timber for external walls, roofed with corrugated asbestos sheets.

The room should be lined with asbestos cement sheets to a height of 2 ft. from the floor, and with wallboard for the balance of the space to the ceiling. Wallboard used for the ceiling will also provide the maximum of insulation.

A veranda extension of the roof, especially on that side of the room which receives the afternoon sun, will reduce the temperature by several degrees, and the covered space afforded by the roof extension will be found useful in many respects.

2. *Ventilation.*—This is important, and can be effectively obtained in conjunction with good natural lighting by the provision of ample glassed windows of the casement type. In addition, openings fitted with efficient shutters should be inserted in the top and the bottom corners of all walls, about 6 inches from the ceiling and floor levels respectively. Size of openings will vary with the cubic capacity of the incubator room, and may be from 6 x 3 inches in a room 10 ft. square to 24 x 6 inches in a room of 40 ft. x 20 ft.

These wall ventilators will ensure the movement of stagnant air and gases from the floor of the room, even though the windows have to be kept closed during bad weather. Ten feet is a good height between floor and ceiling.

3. *Sanitation and Cleanliness.*—Every facility should be provided for quick and efficient cleansing of the room, for the removal of a large batch of chicks and subsequent cleansing of incubators is a messy job, and has to be done within a few hours if incubators are to be re-set to schedule.

There is only one satisfactory flooring material for an incubator room, and that is concrete. The floor should be sloped gently towards a drain, and a water faucet and hose installed within the room; the room can then be efficiently hosed and swept clean with a minimum of time and labour.

4. *Ample Working Space.*—The space around machines should not be restricted, for in addition to causing a possible shortage of oxygen, so necessary to good hatching results, a cramped area not only reduces the efficiency of the operator but in many cases is the indirect cause of loss through egg breakages.

5. *Fittings.*—A strong work bench is an essential fitting, and sufficient shelves or racks should be provided to accommodate all egg trays that have to be filled at one setting of machines; efficient artificial lighting must be suitably installed for night working and testing of eggs.

Feed Shed.

The feed shed should be built in some suitable position adjacent to the sheds, and should be fitted with sufficient rat-proof bins to hold a month's food supply.

A wooden floor built on stumps to the level of the motor truck body makes for ease of unloading supplies. Rats and mice having a tendency to breed around a feed shed, the system recommended in many overseas publications of building the feed shed as one section of the laying sheds does not appear wise; for vermin will have unrestricted run of rafters between feed and laying sections. If the feed shed is isolated, dogs or cats will eliminate vermin as they leave the feed shed to look for water.

Summer School for Young Farmers.

SIXTY boys attending Rural Schools in different parts of the State were selected to form the first agricultural summer school under the aegis of the Department of Public Instruction, and which was held in January at the Queensland Agricultural High School and College, Lawes. Under the leadership of Mr. J. P. Kahler, School Project Club Organizer, the school was an unqualified success. Of the boys attending the course, many were members or had been members of school project clubs and most of them were from farm homes.

For practical instruction, three groups were formed and later welded into evenly matched teams among whom a healthy sporting spirit was developed. Each week group leaders were elected by the boys, subject to recall if they proved unable to attain the high standard of leadership set. To the group leaders was allotted the task of introducing the groups to lecturers and demonstrators, acting as spokesmen on necessary occasions and as sports captains during their week of duty, and maintaining the cohesion of the groups on educational tours.

The programme was so arranged as to give the boys some training in thinking about the various jobs they may have to do in their home environment, basing action on rule of reason rather than rule of thumb. With appropriate breaks, lectures were set for the mornings and practical instruction for the afternoons. Ample provision for recreation was made by the Physical Education Branch, and which included swimming, gymnastics, and ball games.

A series of excellent techni-colour films lent by the Australian Wool Board and the International Harvester Company provided appropriate backgrounds to the lecture courses.

Lecture subjects included the following:—Some Ideas on Physics applied to Farm and Garden; Microbes on the Farm; Plant Pests and Diseases; Judging Livestock; Housing Systems; Poultry Farming; Irrigation; Dairy Practice; Horticulture; Tillage and Fertility; Principles of Crop and Animal Husbandry; Beekeeping; Elementary Forestry; and The Home Garden.

Outstanding events included visits to the Animal Health Station at Yeerongpilly and to the Department of Agriculture and Stock. At Yeerongpilly, practical demonstrations in simple veterinary practice were staged. At the Department, the boys were marshalled in two groups and were received in turn in the several laboratories where they saw in actual operation some of the methods by which science is applied to agriculture.

The boys displayed intelligence and keen interest in all they saw and heard. To some, perhaps, the quick movement from laboratory to laboratory and from subject to subject was, perhaps, rather bewildering, but from casual conversations during their rest and luncheon periods it was obvious that their general impressions of departmental services and facilities were sound and probably lasting. As representatives of country schools in the agricultural districts of Queensland, the young farmers had evidently become merged into a purposeful and happy team.

As one of the first fruits of the recent Commission of Inquiry into Agricultural Education, the 1947 Summer School was a pronounced success, the outcome of capable leadership and complete organization.

Plate 39.

YOUNG FARMERS IN BRISBANE.—Summer Agricultural School for Primary School pupils, including boys from all parts of the State, on a visit to the Department of Agriculture and Stock.

GENERAL NOTES

Staff Changes and Appointments.

Mr. W. G. Murrell, B.Agr.Sc. (Willoughby, N.S.W.) has been appointed Assistant Bacteriologist in the Division of Animal Industry, Department of Agriculture and Stock.

Egg Board Boundaries.

An Order in Council has been issued under *The Primary Producers' Organisation and Marketing Acts* extending the boundaries of the Queensland Egg Board. In October notice was given of the intention of the Governor in Council to make an Order in Council extending the provisions of the relevant legislation to eggs produced in that portion of Queensland comprised in the shires of Mundubbera, Chinchilla, and Murilla, and in those parts of the shires of Gooburrum, Kolan, Perry, Biggenden, Gayndah, Wondai, Kingaroy, Wambo, Tara, and Waggamba lying west of a straight line drawn from a point at the mouth of the Kolan River (north of Bundaberg) on the southern bank thereof to Hunter Railway Station (near Goondiwindi) on the South-Western Railway, and thence to the southern boundary of the State, and placing eggs produced by growers in such portion of Queensland under the control of the Queensland Egg Board. A petition was invited from growers as to whether or not such Order in Council should be made. Such petition had not been received at the expiration of the prescribed period on 18th November.

Central Queensland Egg Marketing Board.

An order in Council has been issued under the *Primary Producers' Organisation and Marketing Acts* declaring eggs produced by growers in Central Queensland to be a commodity under the abovementioned Acts and constitutes a board, to be known as The Central Queensland Egg Marketing Board, for the period from 9th January, 1947, to 8th January, 1950. The members of the first board appointed for a three years term from the 9th January are:—Messrs. R. H. Webb (Mount Larcom), A. Wynd (Wowan), H. Jones (Ridgelands), H. J. W. Willis (Cremorne, North Mackay), and the Director of Marketing (Mr. H. S. Hunter).

Milk and Cream Pasteurization Plant at Townsville.

An Order in Council has been issued under *The Milk Supply Act* authorising The Atherton Tableland Co-operative Dairy Association Ltd., of Malanda, to establish and carry on a pasteurization plant at Townsville and to supply pasteurized milk and cream within the area of the City of Townsville.

Copper in Proprietary Licks.

An amendment of regulations under *The Stock Foods Acts,* 1919 *to* 1935, provides that the amount of copper which may be present in any stock food shall not be greater than 140 mg. per lb. (approximately ½ oz. per 100 lb.). The amendment will provide for control of the amount of copper which may be included in proprietary licks for use in overcoming a nutritional deficiency in sheep resulting in "steely" wool. It will afford a guide to manufacturers of this class of lick and protection to the users, and thereby reduce the possibility of fatalities from copper poisoning.

Northern Pig Marketing Board.

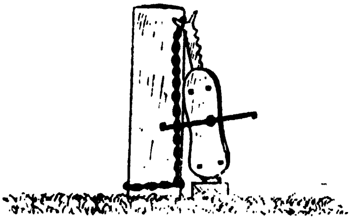
An Order in Council has been issued under the *Primary Producers' Organisation and Marketing Acts* extending the operations of the Northern Pig Marketing Board for the period from 1st January, 1947, to 31st December, 1949. The following have been appointed members of the Board until 31st December, 1949:—Messrs. R. A. Johnston (Hillcrest, Malanda), C. W. Roseblade (Yungaburra), G. R. Barnard (Upper Barron), J. E. Foxwell (Kureen, Malanda), G. H. Henning (Kairi), and H. S. Hunter (Director of Marketing).

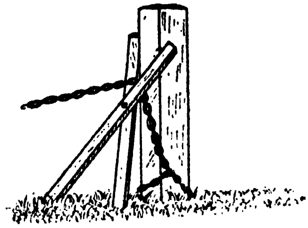
GADGETS AND WRINKLES

HOW TO PULL UP A FENCE POST.

These simple methods of pulling out fence posts cheaply and quickly are particularly useful if a line of posts has to be pulled out.

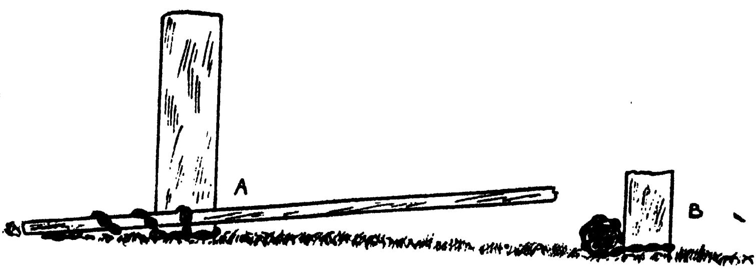
The main essentials are a timber jack and a stout chain, with a strong hook at one end.





The chain is looped round the foot of the post, and the loop is closed with the hook. The remainder of the chain is then lifted and, when taut, one of the links is laid in the lug of the jack, which is held erect and as close to the post as possible. The jack, which must touch the post where the chain engages it, is then wound up and the post comes up with the chain. It is important that the chain be kept taut and that the jack be as near upright as possible. When the ground is wet and sticky the foot of the jack is inclined to sink in as the jack is wound up. This sinking can be avoided by resting the butt of the jack on another post or on a length of 4 in. by 3 in. timber.

On all but the stickiest and tightest country the following method of pulling a post will usually prove successful. Take a strong pole about 12-14 ft. long (white manuka is suitable) and fasten a chain round the foot of the fence post and then to the pole about 2 feet from one end, leaving no slack chain between the pole and the post. By pulling up the far end of the pole the post may be lifted, although it usually pays to loosen the soil around the post before attempting to draw it. The chain must be taken round the lever from the outside so that the first loop can be gripped between the lever and the post. If the process is reversed the lever will simply turn in the operator's hands and will not exert any lift at all. Example "B" explains.



A third simple method useful on light country is to make a V of two pieces of 4 in. by 3 in. timber about 3 ft. long, which are bolted together. The crossed timber should reach between second and third wires from the top of post on the same place as the stay and should touch the post where the chain passes over it. A chain fastened to the bottom of the post is carried over the top of the V and hitched on to the swingle tree, and the post pulled out by a horse.—A. V. Allo, Instructor in Agriculture, Thames (N.Z.), in the *New Zealand Journal of Agriculture*.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

ILL HEALTH OF EMOTIONAL ORIGIN.

IT has been stated that between one-sixth and one-third of all the ailments the medical practitioner meets in his daily round are psychological in origin. A reliable authority in America has reported that the mentally ill occupy more than half the available hospital beds in that country. It is becoming recognized that the vast proportion of ill-health in any community is not due to physical but to psychological causes related to emotional development during childhood. The question arises as to how this can be influenced.

A mother seeks advice because she is worried about her child who is thin and irritable, and perhaps not interested in his food. She has given him various "tonics" without apparent improvement. On examining the child, no physical cause may be found. It then becomes necessary to explain to the mother that the child has emotional needs which are just as vital to his health as dietetic and other physical needs. His earliest emotional need is for maternal love and protection. He requires to feel that he is wanted, and is secure in his family and other relationships. There requires to be harmony in the home; an absence of fear and anxiety on the part of the parents. The child's instinctive curiosity and his need for self-expression and self-assertion require to be recognized and guided into suitable channels.

The ultimate aim of child guidance and care should be the preservation of his health, not correction of behaviour merely because of its nuisance to the family. A child's restlessness, mischievousness, and destructiveness are but expressions of his development; evidences of an active mind, and in order to find an outlet for this activity, a play area and equipment appropriate to the child's development need to be provided.

Parents require to realize that emotional control and self-discipline can best be developed by example.

The building of the health and character of a little child is a greater, more important, and more lasting work than any other civic duty.

Any further information on this or any other matter concerning maternal and child welfare may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane,* or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

IN THE FARM KITCHEN.

A Variety of Dishes.

Mutton Brawn.

Take four shanks of mutton, joint and wash, taking care to remove small pieces of bone. Put in saucepan and bring to boil, skim and let simmer until all the meat leaves the bones. Remove bones and gristle and any fat. Add salt and pepper and a small quantity of gelatine. Return to the fire and boil up for a few minutes, then pour into a damp mould to set.

Crummed Ox-tail.

Cut tail into sections, remove fat from fleshy end and cook in salted water till tender. Drain, dip each piece in beaten egg, roll in bread-crumbs and fry golden brown. Serve with tomato gravy. The stock can be used for making soup.

Mixed Vegetable Salad.

Potatoes cut in slices, French beans, young carrots, turnips, beetroot—all these previously boiled, can be used in a salad. Add one tomato and one apple cut in small pieces. Dress with vinegar, salt and pepper, a little chopped onion and tomato sauce. Season one hour before serving.

A Useful Snack.

Make a stiff paste with ¾ lb. flour, ¼ lb. fat, ½ teaspoon salt, a little warm water. Work well and roll out thinly. Cut into large rounds. On each round place a little force-meat, made with left-over cold meat mixed with a little chopped onion, parsley, and mixed herbs, highly seasoned with salt and pepper, or use cold cooked vegetables, cut into dice, or sausage meat. Fold the paste over this, see that it is well sealed on all sides, damping it slightly if necessary to make it hold together, and bake in a moderate oven.

Green Pea Salad.

Cooked peas, lettuce leaves, salad cream, cucumber and tomatoes. Arrange small lettuce leaves on plate so that the stalks meet in the centre. Mix the peas with some salad cream and pile them up in the centre of the plate. Decorate with a ring of tomato and cucumber slices.

A Good Cheese Souffle.

Quarter pound of butter (melted), 2 oz. flour, ¼ lb. grated cheese, two heaped tablespoonfuls of bread-crumbs, quarter pint milk, three eggs, salt and cayenne pepper. Mix flour, butter, and seasoning. Stir in milk; bring slowly to boil, stirring all the time. Add cheese, bread-crumbs, and beaten egg yolks. When cool fold in stiffly-beaten whites. Pour into well-buttered souffle or pie-dish and bake a delicate brown. Serve immediately.

Fruit Melba.

Prepare 1½ lb. rhubarb, gooseberries or cherries and stew till almost done with 1½ tablespoons sugar and ½ pint water. Be careful to keep the fruit whole; if using rhubarb weigh it after it is sliced. When ready drain off juice, measure it, turn into a saucepan and add a little red jam, allowing 1 tablespoon to ¼ pint of juice. Mix these together, boil a few minutes, and add the fruit. When cold serve with custard.

Ragout of Vegetables.

Two parsnips, carrots, onions, potatoes, some finely-chopped parsley, 2 oz. butter, pint of milk, seasoning, 2 meat cubes, 2 tablespoonfuls dried green peas which have been soaking all night. Prepare and slice vegetables. Melt the butter in a pan, and fry the vegetables, stirring them from time to time, add parsley, and dissolve cubes. Season and simmer in the milk until vegetables are quite hot, adding the boiled peas last. Serve in a hot dish.

QUEENSLAND WEATHER IN JANUARY.

In marked contrast to a poor seasonal rainfall distribution over practically the whole State during January, 1947, the South Coast, Moreton, and East Darling Downs Divisions had district rainfall averages of 66 per cent. and 45 per cent. above normal, respectively. This heavy to flood rain resulted from a cyclone which crossed the Queensland coast approximately 40 miles north of Brisbane and recurved over the south-east corner of the State during the 23rd to 26th, bringing considerable benefit to this important food producing area despite the damage resulting, in parts, from flooding and high winds. For the four days ended 9 a.m. 26th, Springbrook had 5567 points (2780 for 24 hours to 9 a.m. 25th—previous highest 1523, 6 February, 1931), Mount Tamborine 3983, Nerang 2777, and there were many other totals over 10 inches. The eastern Downs had general 3 to 6 inch falls. Port Curtis had 3 inch totals about Bundaberg, but variable registrations elsewhere, and falls on western Downs were light only Flooding was particularly heavy in the Logan and Albert River Basin, the highest since 1887 and 1893. At Slacks Creek, flood waters reached telephone wires; the following peak river heights were reported—Logan River, Dulbolla 45 ft. 9 ins. (25th), Beaudesert 47 ft. 9 ins. (25th). Albert River, Bromfleet 52 ft. 6 ins. (25th), Lumeah 32 ft. (25th). Lower tributaries of the Brisbane River rose as follows—Warrill Creek, Harrisville, 24 ft. 9 ins. (25th), highest since 27 ft. 4 ins., 17 February, 1893, and Bremer River, Ipswich, 46 ft. 6 ins. (26th), highest since 47 ft. 5 ins., 7 February, 1931. There were moderate rises also in the Condamine and MacIntyre Rivers. Rail, road, air and shipping traffic was disrupted by the cyclone. Two lives were lost in the floods. Serious soil erosion occurred and flood damage to roads, bridges, farm property, fencing etc., and crops was estimated at over £500,000.

Apart from the Moreton and East Downs Divisions, district average totals were well below normal, especially in the South-West, Central-West and Tropical Coast Divisions where deficiencies ranged above 80 per cent. Rainfall inland was of the patchy thunderstorm type, the Maranoa (47 per cent. below normal) and Central Lowlands (51 per cent. below) faring better than other Divisions compared to averages. A district average of 156 points for the Central Lowlands was the best there since January last year. Excluding the south-east corner of the State, only six stations of the telegraphic network had monthly totals above normal.

Pressure.—Moderate to rough seas developed along the whole coastline on 20th, substantiating suspicions of a deepening depression over the Coral Sea which was located as an intense cyclonic centre approximately 450 miles E.S.E. of Willis Island at 9 a.m. on the 21st moving southerly to south-west. The cyclone continued this movement on 22nd developing very rough seas and gale south-east winds south from Rockhampton, increasing to high seas and heavy gale south-easterlies by 23rd when the cyclone (below 29.3 inches) crossed the coast in the vicinity of Caloundra approximately 40 miles north of Brisbane.

Temperatures.—Average maximum temperatures reached record or near record figures in many inland centres, being generally above normal by as much as 4 to 7 degrees; average minimum temperatures ranged up to 5 degrees above normal. In Western and Central Divisions, stations reported temperatures of 100 degrees or over for 25 to 30 days of the month. Urandangie had 11 consecutive days of 110 degrees or over (19th to 29th) and Boulia 9. Maximum temperatures of 118.3 degrees Longreach (26th), 118 degrees Boulia (28th), 114.4 degrees Barcaldine (26th), established new records for those towns, while Windorah 116 degrees (27th), Urandangie 115 degrees (25th and 28th), and Adavale 115 degrees (26th), equalled the previous highest for January.

Brisbane.—Mean pressure 9+3 29.870 inches (normal 29.869). *Temperatures.*—Mean maximum 84.8 degrees (normal 85.4 degrees), mean minimum 70.9 degrees (normal 69.1 degrees), mean temperature 77.9 degrees (normal 77.3 degrees); highest daily 91.6 degrees (27th, lowest daily 65.9 degrees (6th). *Rainfall.*—1191 points on 14 days (average 628 on 13 days). (Up to January 22nd the Bureau had only recorded 23 points, which was the lowest on record for 1st/21st January in any year). *Sunshine.*—Mean daily 7.7 hours (normal 7.4). *Maximum wind gust.*—South 50 miles per hour (23rd).

The rainfall position summarised—

Division.	Normal Mean.	Mean Jan., 1947.	Departure from Normal.	Progressive Totals, May to end of January.	
				Normal.	1947.
	Points.	Points.	Per cent.	Points.	Points.
Peninsula North	1389	557	60 below	2605	1481
Peninsula South	935	555	41 „	1980	1314
Lower Carpentaria	725	239	67 „	1453	576
Upper Carpentaria	628	230	63 „	1478	695
North Coast Barron	1328	238	82 „	3274	1033
North Coast Herbert	1411	65	95 „	3852	744
Central Coast East	893	122	86 „	2340	565
Central Coast West	537	79	85 „	1504	438
Central Highlands	400	165	50 „	1670	721
Central Lowlands	321	156	51 „	1187	372
Upper Western	316	73	77 „	869	352
Lower Western	170	26	85 „	736	113
South Coast Port Curtis	658	232	65 „	2484	1230
South Coast Moreton	671	1112	66 above	3059	2241
Darling Downs East	375	543	45 „	2044	1690
Darling Downs West	298	111	63 below	1607	827
Maranoa	302	159	47 „	1583	707
Warrego	214	19	91 „	1202	307
Far South-west	191	29	85 „	913	144

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

MARCH.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.41	6.20	Cairns	32	26	Longreach	36	34
6	5.44	6.15	Charleville.. ..	27	27	Quilpie	35	35
11	5.46	6.10	Cloncurry	52	47	Rockhampton ..	11	9
16	5.49	6.04	Cunnamulla ..	29	29	Roma	17	17
21	5.52	5.59	Dirranbandi ..	19	19	Townsville.. ..	26	22
26	5.54	5.53	Emerald	20	18	Winton	42	38
31	5.57	5.48	Hughenden ..	36	33	Warwick	4	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	p.m.
1	1.25	11.59
2	2.30	a.m.
3	3.32	12.59
4	4.27	2.03
5	5.16	3.11
6	5.59	4.19
7	6.37	5.25
8	7.12	6.27
9	7.45	7.28
10	8.18	8.26
11	8.51	9.24
12	9.26	10.20
13	10.04	11.17
		p.m.
14	10.47	12.12
15	11.33	1.07
	a.m.	
16	..	1.58
17	12.23	2.47
18	1.16	3.31
19	2.12	4.12
20	3.10	4.49
21	4.07	5.24
22	5.05	5.58
23	6.08	6.31
24	7.03	7.04
25	8.04	7.40
26	9.07	8.19
27	10.12	9.03
28	11.19	9.54
	p m.	
29	12.24	10.52
30	1.26	11.54
31	2.22	..

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19:
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	11	29	26	44	0	20	28	52
6	14	26	29	42	4	17	33	49
11	24	14	41	30	16	5	47	34
16	30	10	45	24	20	0	53	27
21	24	15	41	30	16	6	47	35
26	14	25	29	41	4	17	33	49
31	11	28	26	43	0	19	28	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	7	52	36	65	20	50	7	44
3	6	53	35	66	20	51	6	44
5	11	49	38	63	23	49	10	41
7	21	39	44	57	29	42	18	34
9	32	29	52	50	36	35	26	25
11	42	18	58	43	43	27	35	17
13	50	10	64	37	48	23	41	10
15	52	7	66	35	50	21	43	8
17	54	5	67	34	51	20	44	6
19	50	10	64	37	48	23	41	10
21	42	19	58	43	43	28	35	17
23	32	29	52	50	36	35	26	25
25	21	39	44	57	29	42	18	34
27	11	49	38	63	23	49	10	41
29	5	53	35	66	19	51	5	44
31	7	49	36	63	20	49	7	41

Phases of the Moon.—Full Moon, March 7th, 1.15 p.m.; Last Quarter, March 15th, 4.28 a.m.; New Moon, March 23rd, 2.34 a.m.; First Quarter, March 30th, 2.15 a.m.

Equinox.—On March 21st at 9 p.m. Eastern Australian Standard Time the Sun will cross the equator and will then rise at true east and set at true west. After this date the Sun will appear to move northward until June 22nd when it will reach its maximum declination north.

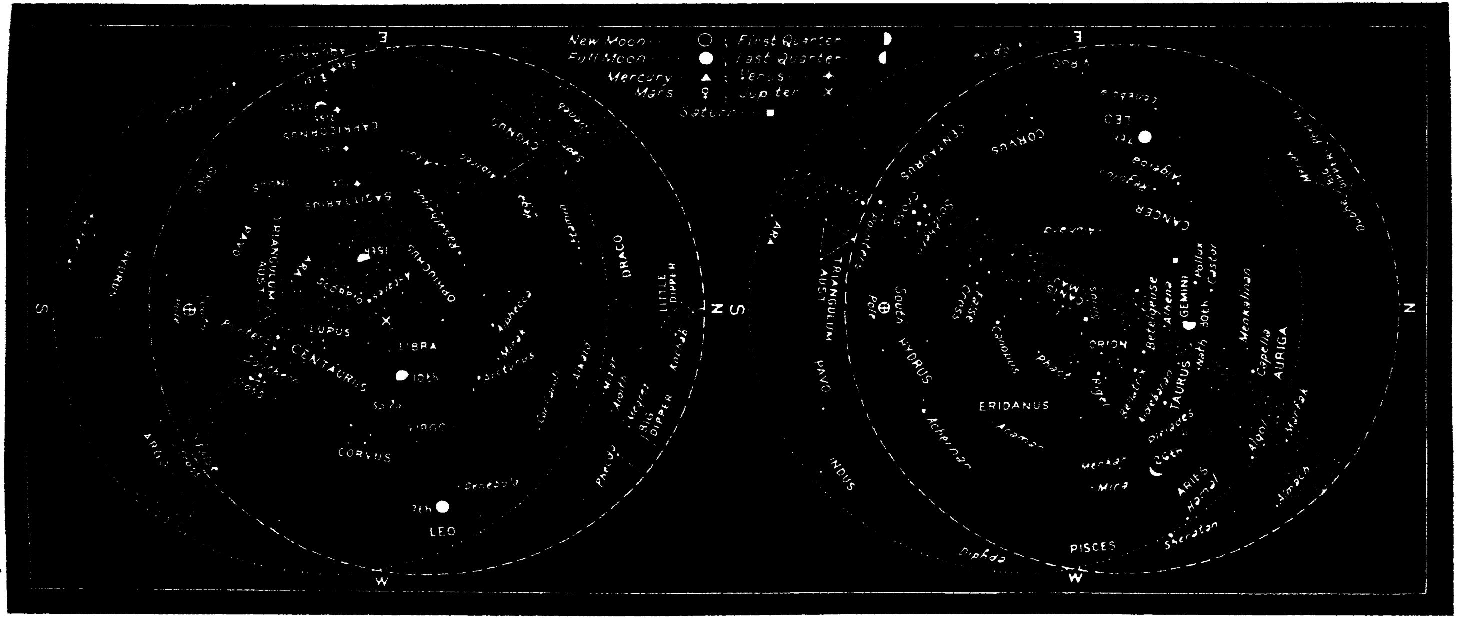
On March 9th and 23rd the moon will set at true west.

Mercury.—At the beginning of the month, in the constellation of Pisces, will set about 30 minutes after the Sun and on the 8th will be in line with the Sun, after which it will become a morning object. On the morning of the 17th it will pass about 4 degrees north of Mars, and at the end of the month, in the constellation of Aquarius will rise about 2 hours before the Sun and will be positioned between Venus and Mars.

Venus.—In the constellation of Sagittarius, at the beginning of March, will rise between 2.15 a.m. and 3.15 a.m. By the end of the month it will reach the constellation of Aquarius and will rise between 3 a.m. and 4 a.m.

Mars.—Still rather too close in line with the Sun for observation, rising about 1 hour Sunrise at the beginning of the month and about 1½ hours before the Sun at the end of the month.

Jupiter.—At the beginning of March, in the constellation of Libra, will rise between 10.15 p.m. and 11.15 p.m. On the 12th the moon will pass in front of this planet, obscuring it from view. From Queensland generally the planet will pass from view at the bottom right-hand side of the moon and will be seen again, about 1 hour later, at the top left-hand side of the moon. The calculated time of disappearance at Brisbane is 10.59 p.m.,



at Rockhampton 10.52 p.m. and at Cairns 10.42 p.m., but the moon then will not be far above the eastern horizon. The times of reappearance at these places are 11.56 p.m., 11.50 p.m., and 11.41 p.m. respectively; the moon then being more favourably placed for observation. That portion of the moon at which the planet disappears will be illuminated, but the spot at which it reappears will be dark.

Saturn.—In the constellation of Cancer will rise before sunset and at the beginning of the month will set between 2.50 a.m. and 4 a.m., and at the end of the month about 1 hour after midnight.

Star Charts.—The chart on the right is for 7.15 p.m in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th March. (For every degree of longitude we go west, time increases 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JANUARY RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.,	No. of years' records.	Jan., 1946.	Jan., 1947.		Jan.,	No. of years' records.	Jan.. 1947,	Jan., 1947.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	11·52	42	19·41	4·42	Gatton College ..	4·32	44	9·27	Nil
Cairns	16·43	61	12·81	3·63	Gayndah	4·70	72	7·10	1·64
Cardwell	16·99	71	25·54	0·22	Gympie	6·57	73	5·08	3·71
Cooktown	14·10	67	9·86	1·31	Kilkivan	5·63	62	9·28	1·63
Herberton	9·31	57	13·93	2·20	Maryborough ..	6·97	72	5·70	6·23
Ingham	15·96	51	26·59	1·42	Nambour	9·37	47	9·30	7·25
Innisfail	20·24	62	30·22	0·81	Nanango	4·65	61	5·19	2·00
Mossman	18·87	19	19·40	5·32	Rockhampton ..	7·39	72	9·71	0·42
Townsville	11·05	72	15·68	0·35	Woodford	7·72	55	6·58	6·03
Central Coast.					*Darling Downs.*				
Ayr	10·95	56	14·09	0·51	Dalby	3·44	73	5·24	4·61
Bowen	9·65	72	18·57	0·19	Emu Vale	3·22	47	7·35	8·84
Charters Towers ..	5·35	61	10·10	0·48	Jimbour	3·51	64	6·91	3·12
Mackay	13·50	72	15·60	1·66	Miles	3·83	58	8·44	2·23
Proserpine	14·95	40	29·12	2·02	Stanthorpe	3·68	70	6·93	6·61
St. Lawrence ..	8·93	72	13·13	0·82	Toowoomba	5·16	71	10·95	4·79
					Warwick	3·58	78	8·07	5·55
South Coast.									
Biggenden	5·25	44	7·69	1·97	*Maranoa.*				
Bundaberg	8·52	60	4·91	3·47	Roma	3·20	69	2·21	2·18
Brisbane Bureau ..	6·28	95	4·68	11·91	St. George	2·64	62	4·62	0·24
Caboolture	7·96	67	5·72	9·92					
Childers	7·23	48	8·43	3·46	*Central Highlands.*				
Crohamhurst	11·78	50	7·21	7·87	Clermont	5·02	72	4·32	1·98
Esk	5·64	56	3·45	6·92	Springsure	4·21	74	6·33	1·61

CLIMATOLOGICAL TABLE FOR JANUARY, 1947.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	90	76	97	24	71	30	363	10
Herberton	..	87	64	95	27	61	23, 26	220	6
Townsville	..	91	78	96	24	70	18	35	3
Rockhampton	29·85	94	74	103	24, 25, 26	69	17, 18	42	3
Brisbane	29·90	85	71	92	27	66	6	1191	14
Darling Downs.									
Dalby	..	92	77	99	9, 12,	58	9	461	10
Stanthorpe	..	84	61	93	12, 16, 17	51	8	661	10
Toowoomba	..	85	64	94	10. 12	58	8	479	9
Mid-Interior.									
Georgetown	29·82	97	74	101	24	69	17	456	10
Longreach	29·80	103	77	118	26	68	12	139	6
Mitchell	29·84	99	71	109	27	60	6	145	5
Western.									
Burketown	..	98	77	105	1	69	23	333	6
Boulia	29·74	108	80	118	28	66	8, 9	10	2
Thargomindah	29·80	103	77	111	26. 28	70	5	2	1

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,

Meteorological Bureau, Brisbane.

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ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

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Event and Comment.

Investigation of Horticultural and other Problems.

IN order to carry out field investigation of horticultural problems in South Queensland, the Department of Agriculture and Stock has acquired a property of 113 acres situated about three miles from Nambour. The location has been chosen with care, and it has the great advantage that within this small area are soils typical of district soils on which pineapples, bananas and citrus fruits are successfully grown; a small area of creek-flat soil also is available.

The new horticultural experiment station is as yet, naturally, in the very early stages of development, but already some valuable and interesting work has been initiated, the results of which will have a direct beneficial bearing on the future of fruit and vegetable culture in the south-eastern districts of the State.

After some years of careful study of undesirable inherited qualities in pineapple plants, there has now been planted at the station some $2\frac{1}{2}$ acres of "pedigree" pineapples. As these are multiplied (and continually re-selected) it is intended that they shall form the basis for a complete changeover to plantings of pedigreed stock throughout the State. Undesirable characteristics which have been minimized or eliminated in this pedigree material includes excessive slip-growths and badly shaped or malformed fruit.

Fortunately, a small area of the new station has been under pineapples for a number of years, and this has provided the opportunity for studies of the best methods of "bringing back" pineapple lands. Different methods of cultivation, fertilization and rotation to leguminous crops are now being tested.

A point of great interest is that the system of planting with contour drains every chain protected the field from erosion during the recent flood rains. Although successive downpours were very heavy there was vitually no loss of soil from the contour-ploughed ground. Farmers on the near North Coast and in other parts of Queensland are naturally interested in how contour ploughing as a means of protecting soils from the washing of torrential rains works out in practice.

A lead also is being given to the young ginger industry by an experiment which is determining the relationship between time of harvesting and yield of crop and its effect on the fibre and taste of the finished product. A tough, hot, fibrous preserved ginger is naturally not attractive to buyers and users and reliable information on the fluctuation of these characteristics with period of growth is obviously important.

Stocks of citrus fruits and avocados for transplanting to fields now in course of preparation are being established. Breeding, improvement of quality, cultural practices and disease- and pest-control will all be studied. Pedigreed stocks will be developed for supply of commercial plantings.

Much work with papaws and bananas has already been done in the district by departmental officers, and some promising types are being developed. This work will be transferred to the new station as soon as the land is ready.

During the war the Maroochy district became an important vegetable-producing area, and these crops also will receive attention.

The Department has acquired another property at Redland Bay on which research work on the problems of vegetable production will likewise be initiated this year. It is proposed, too, to test out the possibilities of crops new to Queensland, and a preliminary planting of the Indian fibre "ramie" has been made. An extensive testing of all available leguminous manure crops also is included in the experiment projects already planned for initiation at Redland Bay.

The establishment of these new experiment stations is part of the general plan for amplifying and intensifying the research work of the Department of Agriculture and Stock for the benefit of the primary industries of Queensland.

Problems of Settlement on the Northern Tablelands.

W. R. STRAUGHAN, Senior Adviser in Agriculture.

MANY people are giving serious consideration to land settlement at present. This is readily explained by the widely publicised world shortage of food supplies and by the interest in land pursuits shown by discharged servicemen. Therefore, it is believed that some notes on the problems confronting intending settlers in one of our northern districts will be of general interest.

Rainfall.

On the Northern Tablelands, as in the other parts of this State, approximately three-quarters of the annual rainfall occurs during the summer months. There is a fairly big variation in the rainfall for different localities, and these latter are somewhat sharply defined.

Storm rains commence in December—occasionally in November—and are a prelude to the set-in conditions extending through the latter half of December and during January, February, March, and occasionally April. Sometimes, however, the commencement of this period of wet weather is delayed until late January, or even early February. Following the "wet season" the rainfall gradually tapers off until October, when the storms, the prelude to the wet season, commence again.

The average annual rainfalls for the principal recording centres on the Tablelands vary from 35 inches at Mareeba to nearly 150 inches at Topaz, east of Peeramon.

The normal dairying districts are confined to that section of the Tableland where the rainfall is in excess of 50 inches per annum. Drier areas are considered unsafe for dairying and are devoted to other forms of rural undertaking such as cattle raising, and at Mareeba and Dimbulah, tobacco growing.

The 50-inch rainfall belt also encompasses the rain forest area as distinct from the open forest country in the lower rainfall belt.

Soils.

The red volcanic (basaltic) loams which so characterise the Tablelands proper also almost wholly coincide with the higher rainfall areas and, since they are far more fertile than the soils derived from schists and

granites, and which are associated with the lighter rainfall and open forest country, their limitations prescribe a natural boundary beyond which dairying does not appear and cannot be expected to thrive.

Towards the 70-inch and in successively higher rainfall belts, the heavier precipitations have leached the soil, leaving it with an acid reaction which is unfavourable for crop production. Consequently, while the Atherton, Tolga, and Kairi areas are eminently suited for maize-growing and other forms of crop production, soils toward Millaa Millaa and Peeramon are generally unsuitable for cultivation, and towards Palmerston appear to be even unsuited for the growth of some popular varieties of grass.

The topography of the country, which is gently undulating around Atherton, Tolga, and Kairi, becomes progressively more steeply undulating and later hilly toward the southern and western perimeters.

Thus the topography of the area also influences the boundaries of the varying Tableland activities, since the gentler slopes around Atherton are suited for cultivation, whilst the steeper gradients to the south and west are neither convenient for ploughing nor safe from erosion, should the grass cover be destroyed.

Since the catchment area, type of soil, and method of cultivation practised all influence erosion, it would be difficult to arbitrarily fix the degree of slope which land in cultivation could stand, but generally land under summer cultivation with a slope of more than 6 per cent. would need protection.

Grassland for grazing would be too steep when it approached the order of 25 per cent., as such slopes will not carry pasture for more than a few years without serious depletion even under the lightest stocking. Production of dairy cattle grazing on such slopes would be impaired as a result of the arduous conditions under which they were forced to feed.

Pastures.

The dominant pasture grasses are paspalum around Malanda and Kikuyu grass in the Millaa Millaa district. The Millaa Millaa area was originally sown with paspalum but was later over-planted with Kikuyu grass, which has now outgrown the original paspalum sward.

Kikuyu grass generally provides a larger volume of feed per acre during the year, is more vigorous in controlling foreign growths and withstands drier conditions better than paspalum. The present limitations of the area under Kikuyu grass are apparently purely artificial. Plantings in Millaa Millaa have been more extensive than elsewhere. It thrives quite well in the Malanda and other areas, but plantings have been limited. It has to be propagated by cuttings and this fact restricts its rapid establishment.

Molasses grass is frequently sown in new scrub burns and in cultivations being returned to grass, and it gives quite satisfactory results if grazing is intelligently controlled. Attempts to establish other grasses and legumes have not so far been entirely successful.

In the less acid soils around Atherton, Rhodes grass is most successful.

Para grass has been successfully established in small areas and provides useful grazing. The climate, however, is generally regarded as being too cool for its best development.

Clovers are in evidence on occasions when spring rains are favourable, but generally suitable rains are not sufficiently frequent to establish this legume in any prominence in Tableland pastures.

Guinea grass, particularly the purple-topped variety, could be advantageously employed as a pasture grass, but so far has not gained favour.

Further grasses and legumes are being continually introduced with a view to augmenting those at present established.

Maintenance of Pastures.

Nearly all soils which are cleared of tropical rain forest quickly lose their original productivity as a result of the leaching effect of high rainfall. They are thus unable to continually support grasses such as paspalum, which demand conditions of high fertility. Inferior types of grasses such as carpet grass, on the other hand, can survive and even grow vigorously in somewhat impoverished soils. Consequently, as the fertility depreciates, paspalum is dominated and replaced by the inferior species.

The general practice of leaving the farm in a few large paddocks instead of subdividing it more thoroughly allows selective grazing by stock. Thus sections of the farm are overgrazed to the detriment of paspalum and other useful grasses which are constantly eaten in preference to the inferior types. The latter remain unchecked and so dominate the more heavily grazed species.

Failure to spread animal droppings reduces the area available for grazing, thus forcing stock to overgraze the non-contaminated pasture.

On flat and slightly undulating country, cultivation of the areas infested with inferior pasture plants can be successfully undertaken and the area resown to pastures. Such a practice on steep gradients is either not possible or inadvisable. In such circumstances, the only remedial measures are linked with prevention—that is, controlled stocking by subdivision whereby rotational grazing can be practised and areas alternately spelled before they become overgrazed.

Carrying Capacity of Pastures.

The average number of stock to the acre of sown or planted pastures on established dairy farms is usually greater than one beast to 3 acres. The intrusion of inferior grasses, particularly carpet grass and blady grass, and also the heavy infestation by wild tobacco and bracken in certain localities, clearly indicate that such a stocking rate is excessive.

On farms where the slopes are not excessive and where stock numbers have been kept below the average figure, pastures generally remain free of such intrusions as the above. It would thus appear that any grazing in excess of one beast to 4 acres will lead to soil improvement and decline of pastures, particularly where there is no provision for the control of grazing.

Establishment of Pastures.

The first essential in establishing pasture is to fall the standing timber. Falling of heavy rain forest (scrub) on the Tablelands costs, by contract work, from £5 to £6 per acre. Burning is usually done by the owner at some appropriate time when the timber is sufficiently dry to burn and weather conditions are favourable for a good fire.

Owing to the high proportion of relatively large timber, good burns are seldom observed; thus provision must be made for a further firing during the following dry season. In such cases the area is generally sown to molasses grass alone or in admixture with other grasses. The molasses grass will carry a fire during the dry weather preceding the next wet season, and while it may be severely checked by the fire, the admixture of the other grass or grasses subsists as an established pasture. Where the original sowing is pure molasses grass, however, the area will probably have to be resown to a suitable grass after the second firing.

Grass seed is usually sown by hand, the speed of sowing being approximately 2 man-hours per acre. The cost of seeding varies with the variety of grass sown, the rate of sowing, and the cost of seed.

Rates of sowing are usually as under:—

Paspalum—2 to 4 lb. per acre (2 lb. in a mixture).

Molasses grass—2 lb. per acre (1 lb. in a mixture).

Guinea grass—2 to 3 lb. per acre (½ lb. in a mixture).

Rhodes grass—3 to 4 lb. per acre (2 lb. to 3 lb. in a mixture).

Kikuyu grass is propagated by cuttings and is usually planted at opportune periods after seeding with other grasses. The cost of establishment is extremely variable, but sufficient cuttings to eventually establish the grass when it is planted on an area already under grass to some other species is not excessive and should require about 3 to 4 man-hours per acre.

Providing the remaining logs and stumps are not sufficient to endanger stock grazing on the area, the pasture may be used during the first year, but this may delay ultimate establishment of a clean pasture. This delay would not be detrimental provided the cover was not sufficiently depleted to allow foreign growths to gain access to the pasture. If, however, it is desired to graze a freshly established pasture in its first season, it will be desirable to materially increase the rate of sowing.

Cultivation.

Outside the maize areas on the Atherton and Evelyn Tablelands, cultivation is confined to fodder crops such as cow cane as a feed reserve and maize or sorghum for silage. The growing of hay crops is not generally practised, since weather conditions are not favourable for curing. In the maize-growing areas, lucerne and winter cereals are produced for hay and grazing.

It is essential that sufficient bulk feed be produced and conserved on the farm to meet the needs of the stock for at least four months of each year. For a herd of forty milking cows, this would require a minimum of 100 tons of maize silage or its equivalent. Normally such a quantity of feed could be obtained from an area of 10 to 12 acres of cultivation. Therefore provision should be made for the cultivation annually of at least 10 to 12 acres of land not subject to erosion.

Cash Crops.

The production of cash crops such as maize, peanuts, cowpea, lucerne, potatoes, and vegetables is virtually confined to the area adjacent to Atherton, Tolga, and the Barron River.

The disadvantages of general cultivation in what are now regarded as the dairying areas are sufficient to discourage any attempts at the production of cash crops. The soils are generally unsuitable for cropping, being too acid in reaction and often not sufficiently fertile. The land is generally too steep for cultivation. The local markets for nearly all truck crops are already well provided for from more favoured areas.

Dairying.

The dairying industry has been established for many years on the Tablelands, but received its greatest impetus following World War I. It is now estimated that dairy farms cover approximately 173,000 acres, mainly in the Shires of Eacham and Herberton, and is the most important local industry. Production is maintained almost entirely from pastures. No system of rotational grazing nor pasture management has been practised, despite the fact that all pastures have had to be artificially established with introduced grasses.

Until recently, butter production was almost the only source of income, but with the introduction of milk pasteurization plants, milk production is now nearly as valuable as butter production. Pig raising has been carried on in a most casual manner and has declined as a result of the increasing popularity of milk production.

The average dairy herd comprises approximately forty mature cows with a very limited number of younger stock for replacements. The usual size of developed properties is about 120 to 160 acres, but varies from as low as 80 acres to over 600 acres in certain instances. The average return per cow is between 173 and 204 lb. of commercial butter fat per year, which at present values gives a monetary return of between £14 and £16 per cow per annum, but better managed properties produce £18 to £20 per cow per annum.

Dairying Districts.

Julatten.

These lands are generally within the belt of the 50-inch rainfall and many of them are rain forest areas, but the fertility even in these is not high. The soils may be generally described as varying from white clays to red loams, the dominant soil being the intermediate yellow clay loam. The rain forest is not dense. Forest soils are very shallow, white clays. Timbers are mainly tea-tree, bloodwood, and popular gum. The fertility of the forest areas is extremely low.

Pastures are generally of paspalum with small patches of Para grass on the creek banks and flats. Molasses, Rhodes, and possibly Guinea grasses would be useful additions. Water is plentiful and well distributed. The small butter factory which was established there some years previously is now closed as the result of insufficiency of supplies.

Malanda.

Soils in the Malanda area are typical red loams of fair fertility and capable of carrying a good body of grass, but becoming too acid and frequently too steep for cultivation.

The carrying capacity of these soils would normally be a beast to 4 acres, excepting where the fertility falls off on some outcrops of shallower and stiffer clay loams, and on the steeper slopes, where the carrying capacity falls to 5 acres per beast. Normally this country can be regarded as suitable for settlement providing the acreage is adequate.

Pastures are dominantly paspalum, though it may be desirable to increase the acreage under Kikuyu, molasses, and, in same areas, Rhodes and Guinea grasses. Cultivation is uusally limited to that section of the district immediately around Malanda and to the north of that centre. Good supplies of water are plentiful. The Malanda Dairy Factory manufactures butter and pasteurizes milk.

Millaa Millaa.

The red loam soils in this area are probably slightly less fertile than those of Malanda, and are consistently acid in reaction and often too steep for cultivation. However, there is a higher rainfall throughout the area and the district's carrying capacity is generally higher than at Malanda, being usually a beast to 4 acres, and in certain favoured but isolated instances as high as one beast to 3 acres.

Areas suitable for cultivation are extremely limited and dairymen are wholly dependent upon pastures for their stock. Pastures are dominantly Kikuyu grass, and on the steep slopes overstocking and soil impoverishment have caused depreciation of the grass. Improvement is unlikely unless a suitable vigorous summer-growing legume can be discovered for the area.

Ravenshoe and Evelyn.

As these districts are situated on a higher elevation the growing season for pasture is somewhat shorter than at Malanda and Millaa Millaa, but soil conditions are similar. There are, however, more extensive areas suitable for cultivation. A fairly extensive belt of shallow soil with a yellow subsoil passes through the district, and large sections of this soil are now carrying bracken fern. Fodder crops and some cash crops have been successfully produced in the area. Water is in adequate supply on the farms. There is a butter factory at Ravenshoe.

Plate 40.

POWER ALCOHOL DISTILLERY, SARINA, MACKAY DISTRICT, QUEENSLAND.

APPLIED BOTANY

Plants Poisonous to Sheep.

S. L. EVERIST, Assistant Botanist.

(*Continued from February, 1947, page 95.*)

Darling Pea.

Other Common Name: Red Darling pea.

Botanical Name: *Swainsona galegifolia* R. Br.

Description: Erect herb up to 18 in. high; leaves fern-like, up to 3 in. long, individual leaflets ¼-¾ in. long, notched at the tip; flowers about ¾ in. long, pea-shaped, showy, varying in colour from purple to deep red, scattered on the long, erect flower stalk which exceeds in height the remainder of the plant; pods balloon-like, about 1 in. long and ½ in. broad, tapered at both ends, dropping on the stalk. (See Plate 41.)

Distribution: In Queensland, this plant is common on the Darling Downs and on heavy soils as far west as about Augathella. It is also found in scattered localities in the coastal districts.

Seasonal Occurrence: Darling pea come up in late winter and spring and most trouble with it occurs during the months of September, October and November.

Evidence of Poisoning:

(*a*) Field: For more than 50 years the plant has been regarded as poisonous, animals affected showing peculiar symptoms and being referred to as "pea struck." Animals so affected develop a morbid appetite for the plant and will eat nothing else when they can get the pea.

(*b*) Feeding tests: As early as 1897, the plant was fed to sheep and produced symptoms identical with those observed in the field.* In sheep two to three years old, symptoms appeared three to four weeks after they began to eat the plant. When hand fed, some of the experimental animals survived for four months, but they were hopelessly crazed. After four to six weeks feeding on the plant and before symptoms were fully established, sheep returned to normal feed recovered completely. Once paralytic symptoms were established, return to normal feed did not bring about recovery, though the animals got no worse.

(*c*) Chemical: Negative qualitative tests for alkaloids and prussic acid on material from Mt. Tamborine have been reported.†

Symptoms: The symptoms have been described* as stupidity, loss of alertness and an agonised expression, followed by stiffness and slight staggering and frequent trembling of the head or limbs. Later, clumsiness and unsteadiness ensue and these slowly advance until the

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* Martin, C. J.: *Agric. Gaz. N.S.W.*, Vol. 8, pp. 363-369, 1897.

† Hines, H. J. G.: Personal communication.

Plate 41.
DARLING PEA.—Dried specimen.

animals often fall down. In this stage, the action of an animal in running over small obstacles is characteristic. It jumps over a twig as if it were a foot high. When first it commences to tumble, it is able to regain its feet, but in the advanced stage of the disease this is impossible. After exhausting itself, it remains lying down until it dies. The sheep becomes progressively more bloodless and the blood contains fewer red cells. All symptoms are much exaggerated by driving. The teeth (especially in young sheep) frequently become loose and consequently displaced or even dislodged.

Post Mortem: There are no obvious changes except emaciation.

Prevention: Generally, sheep may be left on Darling pea for up to four weeks. During that time it will afford a fair amount of nourishment without causing permanent injury. After that time, any "pea-eaters" should be removed to pasture free from Darling pea.

Dwarf Darling Pea.

Common Name: No distinctive common name has been reported for this plant. The name above has been coined to indicate the habit of growth of the plant.

Botanical Name: *Swainsona luteola* F. Muell.

Description: Twiggy, much-branched herb; branches at first flat on the ground, turning upwards towards their ends; leaves, fern-like, 2-3 inches long, individual leaflets oval, $\frac{1}{4}$-$\frac{3}{4}$ inch long; flower stalks shorter than or as long as the leaves; flowers small, blue when fresh, set close together on the stalk; pods narrow, sloping obliquely upwards, fairly thick in texture, becoming hard and brittle when ripe, with a well-marked groove along the upper side. (See Plate 42.)

Distribution: In Queensland dwarf Darling pea is found mainly in the Springsure and Clermont districts and on patches of downs country between Roma and Augathella. It grows chiefly on black or chocolate soils.

Seasonal Occurrence: The plant comes up in late winter and spring.

Evidence of Poisoning:

(*a*) Field: In Queensland, the plant has been suspected on several occasions and several cases are recorded from New South Wales. In a case from near Augathella, sheep died over a period of about a week. Some badly affected animals did not recover, but those slightly affected appeared to get well.

(*b*) Feeding tests: In New South Wales the plant was proved to be poisonous if fed over a long period. With the high rate of consumption of 9 lb. per sheep per day, 41 days elapsed before symptoms appeared.* In another test sheep consumed $2\frac{1}{2}$ lb. each per day and symptoms developed after 51 days' feeding.† At Yeerongpilly, sheep fed 1 lb. each per day for 28 days were showing no effects when the test had to be discontinued because of shortage of material.

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* Cleland, J. B., and McDonald, A. H. E.: *Agric. Gaz. N.S.W.*, Vol. 28, pp. 735-739, 1917.

† King, R. (1933): quoted by Hurst, E. "The Poison Plants of New South Wales" p. 192, 1942.

(*c*) Chemical: A moderate qualitative test for alkaloid in dried material has been reported.‡

Symptoms: The symptoms have been described§ as loss of sense of direction and muscular co-ordination, shivering, and walking with a proppy gait. After falling over, affected animals stiffen out and continue shivering until death, which occurs soon after falling down or up to 24 hours later. Some badly affected sheep hold their heads high, are stiff in both front and hind legs, the respiration is fast and heart fast and weak and the eyes glassy.

Plate 42.
DWARF DARLING PEA.—Dried specimen of complete plant.

Post Mortem: On post mortem, sheep in New South Wales§ showed emaciation, some clear colourless peritoneal and pleural fluid and slight congestion of the spinal cord and brain. No noticeable abnormalities were present in the Queensland sheep examined.

Prevention: The same methods apply to dwarf Darling pea as to Darling pea.

Thorn Apple.

Other Common Names: Native thorn apple, castor oil plant.

Botanical Name: *Datura Leichhardtii* F. Muell.

Description: Erect annual herb up to 18 inches high, with a strong, nauseating smell; stems smooth, thick, repeatedly forked; leaves, soft, smooth, very dark green, slightly toothed, 3-5 inches long, including the stalk, 1-2½ inches wide; flowers, white, funnel-shaped, 2-2½ inches

‡ Webb, L. J.: personal communication.

§ Swinburne, C. J.: unpublished report, Department of Agriculture and Stock files, 1939.

long; fruits about 1 inch in diameter, covered with stiff (not sharp) prickles, drooping when ripe, the enlarged calyx forming a cup; seeds black. (See Plate 43.)

Distribution: In Queensland, the plant is found mostly on down country, especially in the Peak Downs area and in the central-west and north-west. It grows best on rich black or dark-grey clay soils and often favours well-worn stock routes, sheep-yards, and homestead gardens.

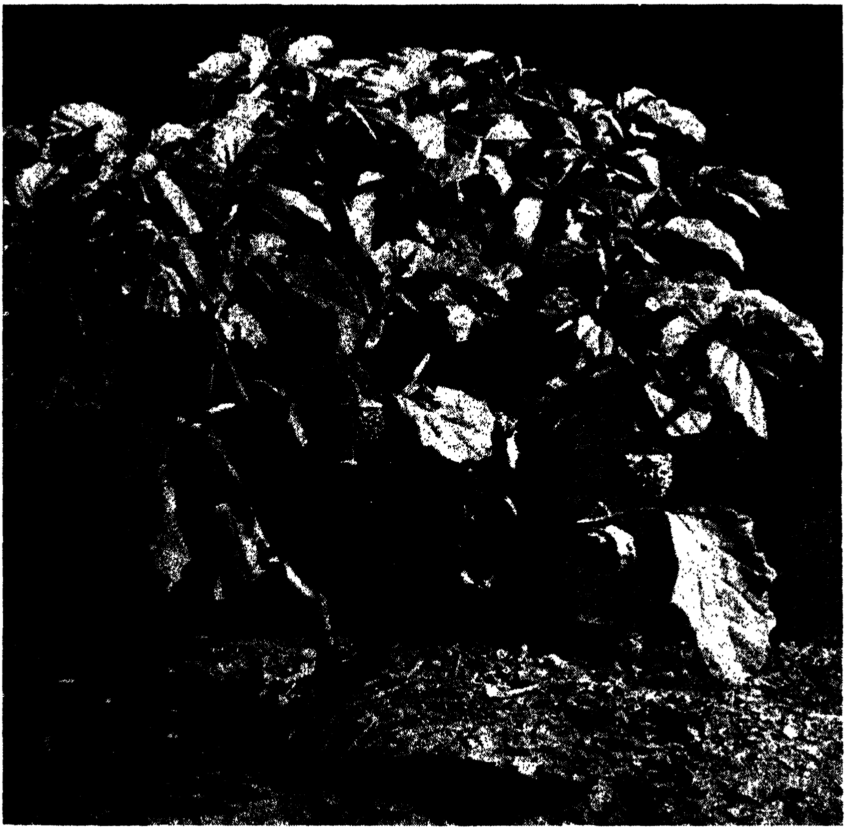

Plate 43.
THORN APPLE.—Mature plant, Westbourne.

Seasonal Occurrence: Thorn apple comes up after spring or summer rains. It is killed by frost.

Evidence of Poisoning:

(*a*) Field: Several cases are on record where this plant has been suspected of poisoning sheep, though other reports state that the plant is sometimes eaten without ill-effect.

(*b*) Feeding tests: Sheep fed with this plant at Yeerongpilly showed no ill-effects. One sheep consumed 6 lb. over a period of 7 days, and another ate 1lb. 7 oz. during 4 days. At Longreach a sheep was fed on the plant for 4 days without effect.

(*c*) Chemical: Thorn apple has been reported to contain alkaloids, the chief of which is scopolamine.

Symptoms: The following symptoms were noted in the case of suspected poisoning by this plant at Clermont:—"Affected animals usually drop to the ground in a sort of rigid spasm or convulsion and die almost immediately. They froth slightly at the mouth and the lips, tongue, and gums become blue after death."

Post Mortem: No post-mortem examination has been reported.

Prevention: If yards are heavily infested with thorn apple it is advisable to chip and burn the weed before sheep are crowded into the confined space. On stock routes there is little danger. Even hungry travelling sheep avoid it, and when it is plentiful other feed is usually available.

Wild Tobaccos.

Common Name: There are several kinds of wild tobacco in Western Queensland, but all of them are known by the same common name.

Botanical Name: *Nicotiana* spp. All species of Nicotiana native to Queensland were formerly known as *Nicotiana suaveolens* Lehm. At least five different species are now known to occur in Western Queensland, though true *N. suaveolens* has not been found there. Most cases of poisoning by these plants have been recorded under the name *N. suaveolens* and it is not possible to say which species was responsible.

Description: Annual herbs with rosette of leaves at the base; flowering stalks erect, usually bearing scattered leaves, smaller than those at the base; flowers white, narrow funnel-shaped, tube differing in length in different species, seed "pods" thin and dry, breaking and releasing great numbers of small seeds. (See Plate 44.)

Distribution: Wild tobaccos are common throughout the western districts, usually on sandy or loamy soils.

Seasonal Occurrence: The plants come up after spring and summer rains and die off in the winter.

Evidence of Poisoning:

(*a*) Field: Deaths in both sheep and cattle have been ascribed to eating these plants.

(*b*) Feeding tests: In New South Wales, 12 oz. or more of air-dried leaves were found to kill sheep rapidly.* Repeated small doses of less than 12 oz. had no effect. Apparently, no tests have been made with the Queensland plants.

(*c*) *Chemical*: All species contain one or more of the three alkaloids, nicotine, nor-nicotine and anabasine.

Symptoms: In sheep, symptoms are reported to be inco-ordination of movement, disturbance of eyesight and emaciation. In cattle, the following symptoms are reported†:—"Inability to travel, inco-ordination of gait, proppy in forequarters and lagging behind, trembling of muscles with tendency to walk backwards when made to rise, paddling

* Seddon, H. R., and McGrath, T. T.: New South Wales Dept. Agric. Veterinary Research Report No. 6, 119-121, 1933.

†Moule, G. R.: Unpublished report, Queensland Dept. Agric. and Stock files, 1942.

[*S. T. Blake*, *photo*.

Plate 44.
WILD TOBACCO.—Mature plants.

movements when down. Death is either rapid or dragged out up to 5 days. In some cases there was respiratory embarrassment with nasal discharge. There was difference of opinion as to ocular disturbance.''

Post Mortem: Post mortem of sheep* has revealed marked congestion of the fourth stomach and bowel, especially the small intestine. In one sheep, general suffusion of the lungs, congestion of the kidneys and liver, empty bladder and pale heart muscle were also noted.

Prevention: Most animals avoid these plants when other feed is available. Hungry mobs of travelling sheep should not be allowed to eat these plants. Since they grow in patches, it is usually possible to shepherd the mob past them.

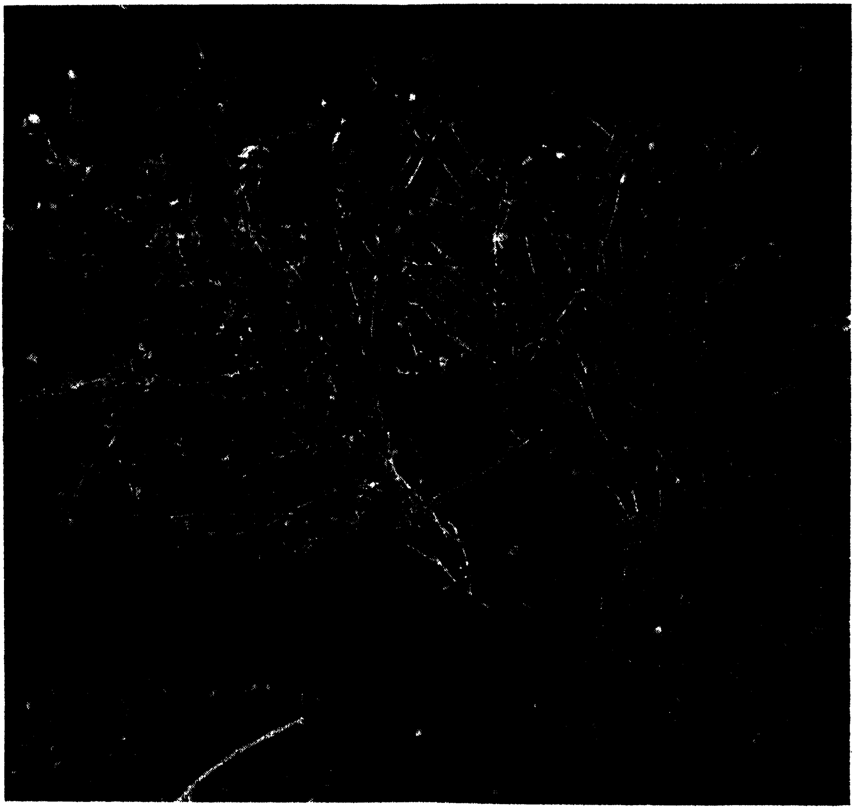

Plate 45.

CAUSTIC CREEPER.—Mature plant viewed from above, Blackall.

Caustic Creeper.

Other Common Names: Milkweed, creeping caustic, balsam.

Botanical Name: *Euphorbia Drummondii* Boiss.

Description: Prostrate herb, all parts with milky sap; stems, leaf-stalks and fruits sometimes dull, dark red, sometimes dull green; leaves

* Seddon, H. R., and McGrath, T. T.; New South Wales Dept. Agric. Vet. Res. Rept. No. 6, 119-121, 1933.

opposite, smooth, ⅛-⅓ inch long and half as wide; flowers small and inconspicuous; fruit about 1/10 inch across, rounded, with three vertical ridges, quite free from hairs. (See Plates 45 and 46.)

Distribution: Caustic creeper is a common weed in almost all parts of the State but is especially abundant on the heavy soils of the interior.

Seasonal Occurrence: The plant grows at any time of the year but most profusely after summer rains.

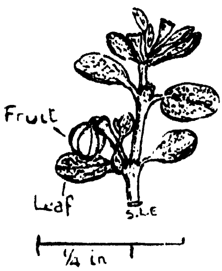

Plate 46.

CAUSTIC CREEPER.—End of stem with leaves and fruit.

Evidence of Poisoning:

(*a*) Field: Many Queensland graziers and drovers are emphatic that caustic creeper is poisonous to travelling sheep but safe for paddock sheep. All agree about the symptoms, which differ from those observed in other States.

(*b*) Feeding tests: In Queensland, feeding tests with sheep and rats gave no result. The amount of material used was small and further tests are needed. Feeding tests in New South Wales gave variable results. In Western Australia, tests with rats gave positive results.

(*c*) Chemical: Plants from some localities have been found to yield prussic acid, but the majority of tests for this substance have been negative. The symptoms observed in Queensland are certainly not those of prussic-acid poisoning.

Symptoms: In all Queensland cases, affected sheep swelled round the head and neck. If the swelling is pierced, a dark amber-coloured fluid exudes and the sheep often recovers. If no action is taken the sheep usually dies. Similar swellings were observed in rats fed experimentally in Western Australia.

Post Mortem: No post-mortem observations have been reported.

Prevention: Paddock sheep appear to eat this plant without ill effect, but care should be taken in moving hungry sheep over stock routes carrying much of this weed.

Treatment: Piercing of the swelling is said to bring about recovery of affected sheep.

Bottle-tree Caustic.

Other Common Names: Desert spurge, caustic plant.

Botanical Name: *Euphorbia eremophlia* A. Cunn.

Description: Erect herb up to 2 ft. high; lower part of stem unbranched, smooth, pale green, often slightly swollen and resembling a miniature bottle-tree in appearance; leaves sparse, pale green, 1-1¾ in. long, narrow; flowers inconspicuous; fruits smooth, 3-celled. (See Plates 47 and 48.)

Distribution: In Queensland, two forms are included under this name. One is a common weed of the sea-coast, the other grows chiefly in western localities. The western plant is widespread and grows on a variety of soils, but mostly on red, brown, or grey loams and clays.

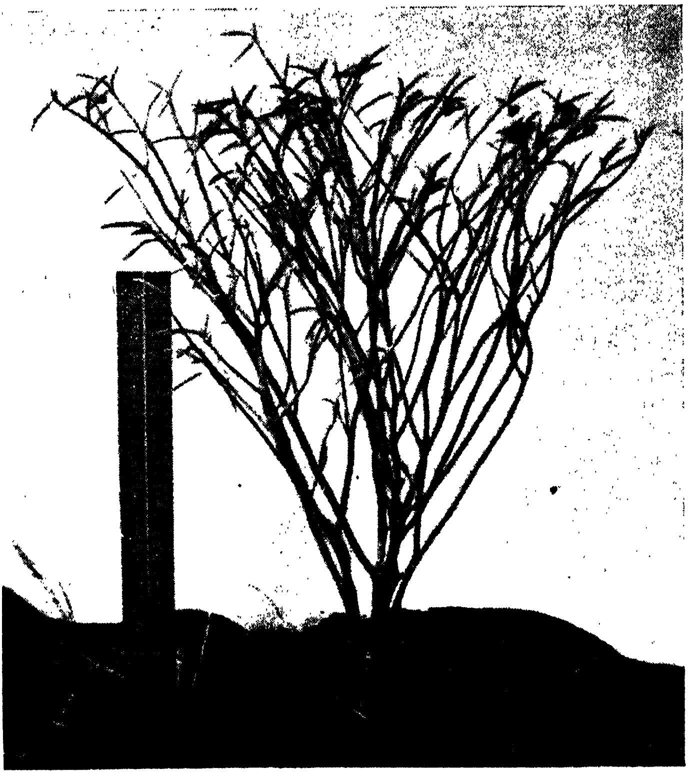

Plate 47.
BOTTLE-TREE CAUSTIC.—Mature plant, Emerald.

Seasonal Occurrence: The western plant comes up after spring and summer rains and according to one report from Mt. Abundance it is most dangerous after the first summer rains.

Evidence of Poisoning:

(*a*) Field: For a long time this plant has been regarded as poisonous by graziers and drovers in Queensland, New South Wales and Western Australia.

(*b*) Feeding tests: Tests in Western Australia showed that sheep could be killed with watery extracts of about 2 lb. of the plant. In New South Wales, sheep fed with this plant scoured badly but showed no other ill effects. Tests at Yeerongpilly were negative, a sheep consuming 8 lb. during a period of one week without effect.

(*c*) Chemical: So far, the poisonous principle has not been discovered. All tests for prussic acid have been negative.

Symptoms: In Western Australia, "staggers," difficulty in breathing and excessive flow of saliva have been reported. Gastritis was noticed in the New South Wales feeding tests. In Queensland, various symptoms have been ascribed to eating this plant, including swellings similar to those attributed to caustic creeper.

Post Mortem: No reliable records of post mortems are available.

Prevention: Paddock sheep neglect bottle-tree caustic. If the plant is plentiful on stock routes, care should be exercised in moving hungry stock through it.

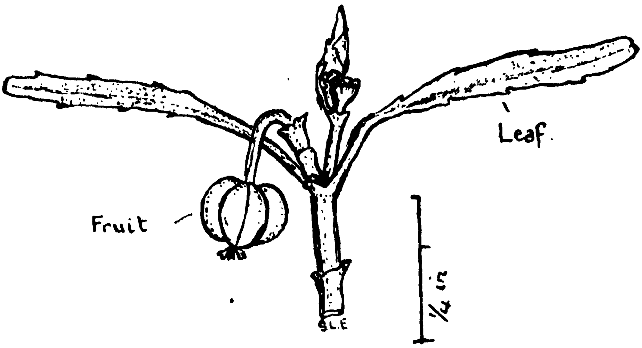

Plate 48.
BOTTLE-TREE CAUSTIC.—End of stem with leaves and fruit.

Flax Weed.

Other Common Names: Wild flax, native flax, broom bush, bootlace plant, Borgia's bouquet, spiked rice-flower.

Botanical Name: *Pimelea trichostachya* Lindl.

Description: Twiggy, much-branched perennial up to 2 feet high; stems slender; bark usually green, very fibrous; leaves about ½ inch long, narrow; flowers small, at first in heads at the ends of the branches but flower-spikes growing continuously until up to 6 inches long; flowers pale yellow with long white silky hairs in lower part. (See Plate 49.)

Distribution: The plant is fairly common in south-western and central-western Queensland, in some seasons forming dense "flax-fields" on the edges of red claypans. It generally favours silty or loamy soils, but is not confined to such situations.

Seasonal Occurrence: Flax weed grows throughout the year and is often green when everything else is dry.

Evidence of Poisoning:

(*a*) Field: On a number of occasions, specimens have been sent to the Department of Agriculture and Stock as a suspected poisonous plant.

(*b*) Feeding tests: At Yeerongpilly, flax weed was fed to sheep with fatal results. All animals had to be force fed. Two sheep died after eating a total of 5½ lb. each, another after eating a total of 6 lb. One died 12 days after the beginning of feeding, one 13 days and one 15 days. All began to scour in from 3 to 5 days.

(*c*) Chemical: No chemical work on the poisonous principle has been reported.

Symptoms: All sheep fed with the plant scoured badly. No other symptoms were noted, the sheep finally being found dead.

Post Mortem: No lesions were found on post-mortem except for some slight congestion of fourth stomach and bowels.

Prevention: Flax weed is extremely distasteful to sheep, but if hungry sheep were brought suddenly on to a green patch of the plant they might eat enough to kill them or scour them badly.

Plate 49.
FLAX WEED.—Dried specimen.

Plate 50.
Common Native Couch.—Dried specimen.

Common Native Couch.

Other Common Names: Gulf star grass, spider grass.

Botanical Name: *Brachyachne convergens* (F. Muell.) Stapf.

Description: Tufted annual grass up to 1 foot high; outer stems spreading at the base and much-branched at the lowest notches; leaves pale, dull green, 1½-3 inches long, 1/10-⅕ inch wide; seed-heads of 3 or 4 radiating "spikes" at the top of a slender, erect stalk; each "spike" 1-3 inches long, with spikelets or "seeds" packed closely in rows along it; spikelets often purplish when young, becoming pale straw-coloured as the plant matures. (See Plate 50.)

Distribution: The plant grows in all parts of Queensland west of the Great Dividing Range with the exception of the far south-west. In addition, it is found in the Charters Towers and Clermont districts. It grows on many soil types, ranging from heavy clay to light sandy loam.

Seasonal Occurrence: The grass comes up after spring and summer rains and dies off in the winter. It is most dangerous when young and green.

Evidence of Poisoning:

(*a*) Field: During the period from January, 1939, to April, 1940, approximately 1,100 sheep died in the St. George district as a result of eating this grass (see the first part of this series). Reports from the Gulf country indicate that the grass is useful for sheep, especially when drying off.

(*b*) Feeding tests: No feeding tests have been reported.

(*c*) Chemical: The plant has been shown to be capable of yielding large quantities of prussic acid when young, but older plants yield insufficient to be dangerous.

Symptoms: Death is usually so rapid that animals are found dead.

Post Mortem: No reports on post mortem have been made.

Prevention: In the St. George district, deaths occurred only in sheep which had previously travelled over bare stock routes and were very hungry. Sheep from the south were fairly well fed before they encountered the grass and no deaths occurred among them. This shows clearly that the only real danger is to hungry sheep. If enough pasture cannot be found to fill them, sheep should be given some hay or other supplementary feed before being driven through patches of common native couch, especially when it is young and green.

Treatment: Affected sheep should be given the hypo treatment immediately symptoms are noted.

Andrachne.

Common Name: No common name has been reported for this plant. The generic name given above seems quite suitable for general use.

Botanical Name: *Andrachne Decaisnei* Benth.

Description: Erect annual herb, rather woody when old, much-branched and very leafy; leaves alternate, pale green, covered with fine

hairs, $\frac{1}{2}$-$\frac{3}{4}$ inch long, $\frac{1}{4}$-$\frac{1}{2}$ inch wide; flowers inconspicuous in the forks of the leaves; fruit like tiny pumpkin, $\frac{1}{8}$-$\frac{1}{6}$ inch diameter, covered with fine hairs, splitting into three parts, each containing two seeds. (See Plate 51.)

Distribution: The plant grows abundantly on black and heavy grey soils in the central-west and north-west.

Seasonal Occurrence: Andrachne comes up after summer rain and dies off in winter. It is most dangerous when it is young and green.

Plate 51.

ANDRACHNE.—Dried specimen.

Evidence of Poisoning:

(*a*) Field: On several occasions the plant has been sent in as a suspected poisonous weed. In one case in the Longreach district affected sheep had been turned into a small yard after shearing and had eaten considerable quantities of this weed.

(*b*) Feeding tests: Feeding tests at Townsville* gave positive results when fresh material was used. A sheep which ate less than 1 lb. died within 50 minutes and a goat drenched with a watery extract from 2 lb. of the plant died in 30 minutes.

(*c*) Chemical: Tests by the Queensland Agricultural Chemist* showed that the plants yield prussic acid, the amount falling off sharply when the plants mature.

Symptoms: In the Townsville feeding tests affected animals showed sudden contractions of the diaphragm, difficulty in maintaining balance, hind legs set well apart, accelerated breathing and pulse rate and laboured breathing. Animals finally were unable to stand, sat down, and finally collapsed on their sides. Convulsive movements were frequent and the animals were greatly distressed.

Post Mortem: Post-mortem appearance has been described as congestion of vessels under the skin, the lining of fourth stomach and sometimes of the first 18 inches of the small intestine. Congestion of kidneys and lungs was also noted and the mucous membranes inside the mouth and the eyelids were blue.

Prevention: Paddock sheep do not eat this plant and even travelling sheep neglect it if there is anything else to eat. If the plants are young and succulent, hungry sheep should be kept off them.

Treatment: Affected animals should be given the hypo treatment.

Red Crumbweed.

Common Name: No common name has been reported for this plant. The above name has been coined to indicate the peculiar crumb-like fruiting clusters and the reddish colour of the stems.

Botanical Name: *Chenopodium blackianum* Aellen.

Description: Herb, usually prostrate, the ends of the branches sometimes erect; stems often reddish; leaves alternate, dull, pale green. $\frac{1}{5}$ to $\frac{1}{2}$ inch long, rounded, the base tapering into a slender stalk; flowers very small, in white globular clusters about 1/12 inch in diameter, all along the stems in the forks of the leaves. (See Plates 52 and 53.)

Distribution: The plant is widespread over the southern half of the State, especially in western areas. It is commonly found in ringbarked country and along roadsides and often favours silty soils.

Seasonal Occurrence: Red crumbweed comes up after summer rain. It is most dangerous when young and succulent.

Evidence of Poisoning:

(*a*) Field: The plant has been accused of poisoning both sheep and cattle.

(*b*) Feeding tests: No feeding tests have been carried out with this plant.

* Churchward, R. E., and Gurney, E. H.: *Queensland Agricultural Journal* Vol. 50, pp. 180-184, 1938.

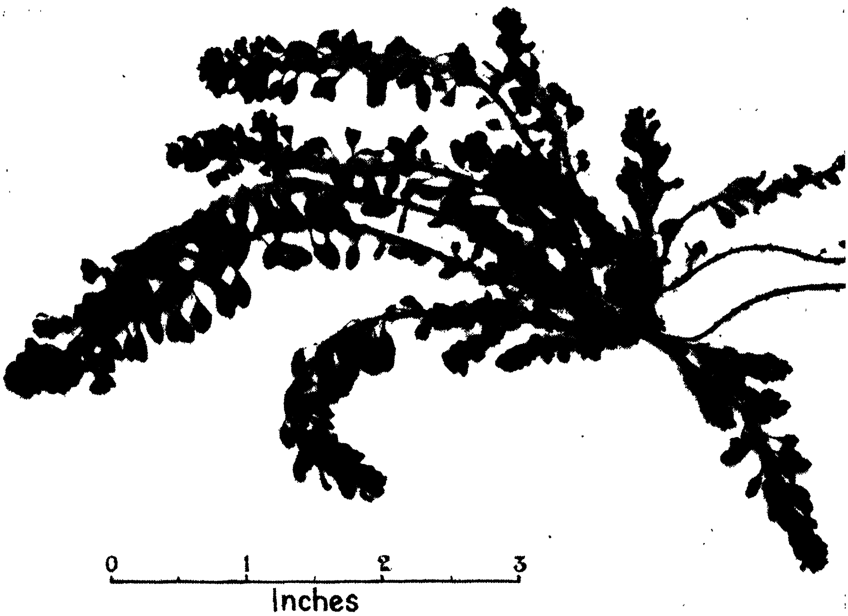

Plate 52.
RED CRUMBWEED.—Dried specimen.

(c) Chemical: The plant has been found to contain an alkaloid and to yield prussic acid.*

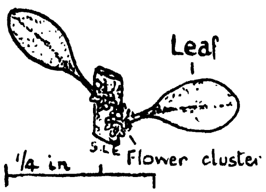

Plate 53.
RED CRUMBWEED.—Leaf and flower-clusters.

Symptoms: Symptoms are not recorded but they are probably similar to those observed in Andrachne poisoning.

Post Mortem: No record of post mortem examination is known.

Prevention: Care should be taken to avoid bringing hungry travelling sheep on to this plant when it is young. In the paddock sheep do not eat enough to harm them.

Treatment: Affected animals should be given the hypo treatment.

Malvastrum.

Other Common Names: Wild mulberry, wild sida retusa, marsh-mallow, bastard sida retusa, yellow weed. None of the common names is in general use except sida retusa which is more correctly applied to a coastal weed. The name malvastrum is being used to an increasing extent.

Botanical Name: *Malvastrum spicatum* A. Gray.

* Smith, F., and White, C. T.: *Queensland Agricultural Journal*, Vol. 3, p. 264, 1915.

Description: Erect, twiggy, short-lived perennial herb or sub-shrub up to 2 feet high, much branched from the base, leaves alternate, green, toothed on the margins; flowers bright yellow, borne in dense spikes at the end of the branches, persisting for a long time after the leaves have fallen. (See Plate 54.)

Plate 54.
MALVASTRUM.—Mature plant, near Blackall.

Distribution: Malvastrum is a common weed in all sheep-raising districts of Queensland and especially in the western areas. It is often thick on stock routes and other trampled places and is also common in ringbarked country. It grows on a wide range of soils but thrives best on the clays and clay loams.

Seasonal Occurrence: The plant grows quickly after summer rain. The seed-heads persist through most of the winter, though often the plant consists of nothing more than bare twigs during the winter months.

Evidence of Poisoning:

(*a*) Field: Malvastrum and some allied plants have been blamed for the condition known as "humpyback" in sheep, especially in the Tambo, Charleville, Cunnamulla and Bollon districts. The evidence is suggestive but not conclusive. Trouble is experienced mostly with woolly wethers during the hot months.

(*b*) Feeding test: At Yeerongpilly, a feeding test carried out with malvastrum gave results which were suggestive but not conclusive. Symptoms produced in the experimental sheep were not quite those seen in the field.

(*c*) Chemical: No chemical work with this plant has been reported.

Symptoms: "Humpyback," for which this plant has been blamed, has been described as follows:—*"Characteristically, the trouble occurs when full-wool wethers are brought in for shearing. After being driven for a short time some animals are observed to lag behind the mob, assuming a 'humpy back' attitude; their hind legs are straddled and slightly bent, and the affected animals breathe rapidly with their mouths open. The gait becomes awkward and uncertain and the animals soon go down. If left alone they regain their feet but are unable to travel. If forced along they soon collapse and die."

Post Mortem: Post-mortem examination reveals very little. Sometimes there is slight congestion of the mesenteric blood-vessels; sometimes slight inflammation of the kidney and congestion of the lungs.

Treatment: If affected sheep are allowed to rest recovery is usually rapid. Some graziers pick up affected sheep in motor trucks, take them to the shed and shear them. The effect is the same as allowing the animals to rest.

Wild Parsnip.

Other Common Names: Parsnip, parsley.

Botanical Name: *Didiscus glaucifolius* F. Muell.

Description: Tufted annual or biennial herb with numerous thin, hollow, erect branching stems from a thick root: leaves mostly crowded at the base of the plant; leaf-stalks about 3 inches long, leaf-blades divided into narrow segments, bluish-green; flowers small, numerous, crowded into bunches (umbels) at the ends of the branches; fruits small, flat, strongly wrinkled. (See Plate 55.)

Distribution: In Queensland, the plant occurs chiefly in the Cunnamulla, Charleville and Adavale districts but it has been found as far north as the lower Thomson River, near Jundah. It grows on red soils.

Seasonal Occurrence: Wild parsnip comes up after winter rain and dies down in the hot months. August and September are considered to be the most dangerous months.

Evidence of Poisoning:

(*a*) Field: In New South Wales, the plant has been suspected of poisoning stock on numerous occasions. In 1914, reports from Charleville stated that the plant was poisonous to sheep. More recently, it has been

* Moule, G. R.: *Queensland Country Life*, 9th May, 1946.

blamed for losses of lambs in the Cunnamulla district, one report stating that the plant was responsible for killing 25 per cent. of the total lambs dropped.

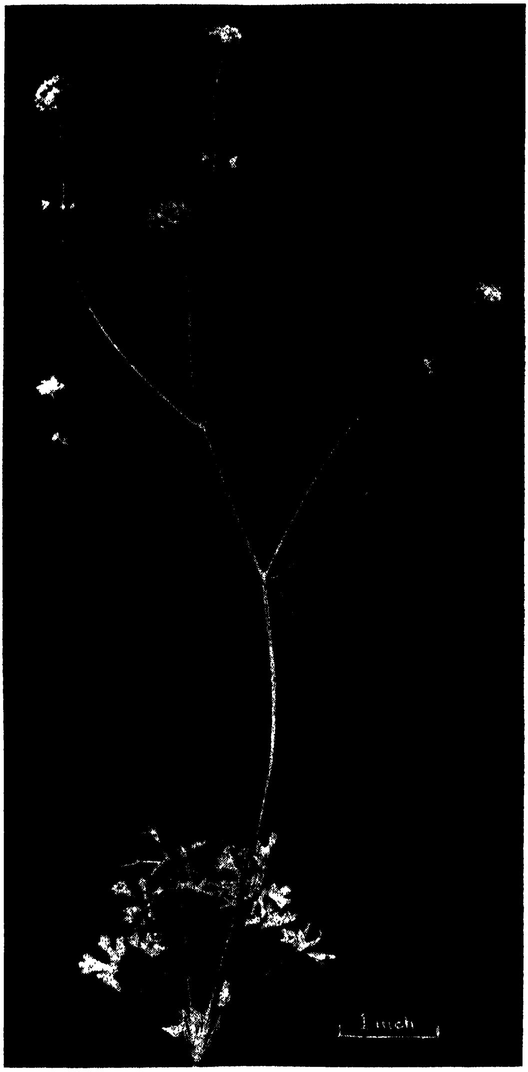

Plate 55.

WILD PARSNIP.—Dried specimen.

(*b*) Feeding tests:* No feeding tests have been made with material from Queensland. Feeding tests in New South Wales gave variable results. Some investigators concluded that the prolonged ingestion of wild parsnip is responsible for gastritis and loss of muscular control and even death, that young sheep are more susceptible than older sheep, and that the poison is cumulative.

* See Hurst, E.: "The Poison Plants of New South Wales," 1942, pp. 305-306.

(*c*) Chemical: Tests on New South Wales material showed the plant to be free from prussic acid and alkaloids. The poisonous principle has not yet been determined.

Symptoms: Various symptoms have been reported from New South Wales. Most cases for which the plant was blamed showed inco-ordination and some of them reported deformation of limbs in young sheep. In the Cunnamulla district, it has been noted† that symptoms appear when the sheep are driven. They travel only a short distance before they begin to tremble and then fall down and die quickly. Young lambs up to four months old suffer a deformity of joints and become "bandy" in both front and hind legs. Quite a number of cases travel on their knees.

Post Mortem: In New South Wales, post-mortem examination revealed inflammation of the stomach in some sheep, in others dilated heart, fatty liver and inflammatory changes in the kidneys. In the Cunnamulla cases, post mortem has shown a purple discolouration of the blood and the liver shrunken and purple in colour.

Prevention: Until more is known about the disease, no remedial measures can be recommended. During late winter and spring, young sheep, particularly lambs younger than four months, should be kept out of paddocks containing much wild parsnip.

Plants Causing Photosensitization.*

Photosensitization is a condition in which an animal becomes abnormally sensitized to light. On exposure to sunlight, unpigmented portions of the skin suffer a very intense form of sunburn.

The principal cause of this condition is eating of certain plants, followed by exposure to strong sunlight. Different plants cause slightly different symptoms, but in all cases the plants must be young and succulent, they must be consumed in fairly large quantity and the animals must be exposed to strong sunlight.

Symptoms: In Queensland, sheep are known to develop two main forms of the condition. These have been given distinguishing names:—

(*a*) *Trefoil Dermatitis*: The muzzle, face, ears and lower unwoolled parts of the legs are affected. If newly shorn, sheep may also be affected along the back. The animals become uneasy and try to hide their faces in whatever shade is available. The areas affected become itchy and animals rub and lick them if they can. At this stage the affected skin is hot, reddened and somewhat thickened. The thickening is due to fluid under the skin and becomes more and more marked as the condition progresses, the muzzle and ears becoming obviously swollen. Small beads of clear fluid exude through the skin and the overlying hair becomes matted. The skin becomes dried and parchment-like and peels off in large flakes, especially over the face. If rubbed, affected parts become raw and covered with scabs of dried blood. As the fluid within the ears becomes absorbed, the skin shrivels and finally the ears become distorted and half their normal size. When the muzzle is badly affected, the lips may be kept parted, the teeth showing in a peculiar

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† Byrnes: Queensland Herbarium records, November, 1942.

* Particulars of symptoms and post mortems supplied by Mr. G. R. Moule, Veterinary Officer (Sheep and Wool).

grin. The coronary band at the edge of the hooves becomes purplish and in bad cases the outside of the limbs may show changes as seen in the face.

(*b*) *Yellow Bighead*: In this condition, jaundice is present as well as the more obvious effects of photosensitization. Animals become uneasy and seek the shade. There is swelling of the face, lips, muzzle, eyelids, and the skin over the nose and cheeks. The ears and lower parts of the limbs also are affected. The whites of the eyes become intensely yellow; the membranes lining the eyelids, the inside of the mouth and the skin become pale, muddy yellow. There is crusting of the eyelids, the skin of which becomes leathery and the eyelids cannot close properly. Inflammatory changes may affect the eyes, causing blindness. The

Plate 56.
BULLHEAD.—Dried specimen.

leathery lips remain parted. Upset to the liver causes the animals to lose condition and sometimes to die. Young sheep (weaners) are more likely to be affected than grown animals.

Post Mortem: Examination shows the tissues to be bright yellow and the liver and kidneys copper-coloured.

Plants Responsible:

(*a*) *Trefoil Dermatitis*: Two plants grow in Queensland which are known to be capable of causing the disease. They are the burr medic or burr trefoil (*Medicago denticulata*) and the small burr trefoil (*Medicago minima*). Both come up after winter rain and are more plentiful in the Darling Downs district than in the sheep-raising areas farther north and west. Both are leafy, prostrate herbs with clover-like leaves, yellow flowers and curly pods covered with soft "spines."

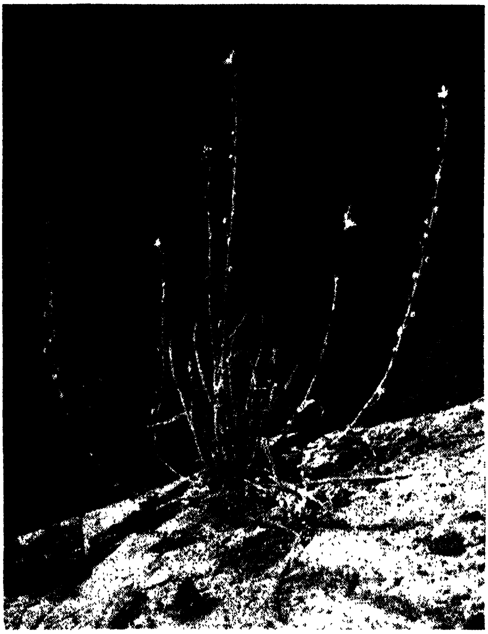


Plate 57.

ONION WEED.—Mature plant, north of Charleville.

(*b*) *Yellow Bighead*: Yellow bighead is much more common in Queensland than is trefoil dermatitis. Various plants have been blamed for causing it. In New South Wales it was found that the native barley grass (*Panicum decompositum*) could cause the disease. In cases observed in Queensland it has been difficult to say exactly what plants were responsible. On field evidence the following have been suspected:—

Paddymelon (*Cucumis trigonus*): This is a weak creeper bearing small melons. It usually grows in heavy soil.

Prickly Cucumber (*Cucumis myriocarpus*): This is similar to paddymelon but has soft, curly "spines" on the fruits.

Bullhead (*Tribulus terrestris*): This is also known as goathead, cat's head, caltrops or three-corned Jack. It is a prostrate creeper with fern-like leaves and yellow, butter-cup-like flowers. It bears burrs with three hard, sharp spines. (See Plate 56.)

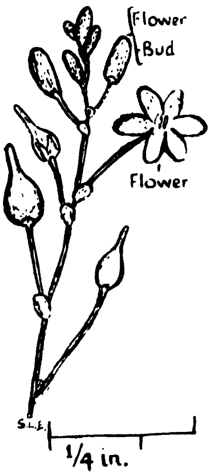


Plate 58.
INFLORESCENCE OF ONION WEED.

Onion Weed (*Bulbine semibarata*): This is a tufted plant with succulent, greyish-green leaves, thick and fleshy at the base, tapering to a fine point. The flower-spikes are erect, up to 1 foot high, and bear small yellow flowers. (See Plates 57 and 58.) It often grows on red loams and clay-loams.

All the above plants grow profusely after summer rains and in good seasons are very green and succulent during the hot weather. It is possible that almost any very green, succulent plant can cause photosensitization in sheep subjected to very strong sunlight.

Treatment: Affected sheep should be put into well-shaded paddocks, preferably where the pasture is different. Badly affected animals should be put in a hospital paddock and the affected parts, especially around the eyes, anointed with carbolized olive oil. Rubbing lampblack or other opaque substances over unwoolled parts often prevents sheep from being affected.

Additional Note on Weir Vine.

After the original material on weir vine poisoning was supplied for publication in the *Journal*, more detailed information became available as a result of feeding trials carried out by the Department. The following additional notes, based on information provided by Mr. G. R. Moule (Sheep and Wool Branch), are given.

Feeding Tests: Feeding tests recently conducted in the field have given positive results. Sheep allowed free access to the weir vine in a confined space developed symptoms after five weeks. During some of the time they had to be hand-fed and their average consumption was 15 lb. of weir vine per head per day.

Symptoms: At first, there is marked loss of condition, then the sheep stands with rump slightly arched and back legs drawn up underneath the body; the head is held high, usually with the ears laid flat. Later, the animal tends to point the nose skywards, the body muscles tremble and the gait becomes uncertain; the arching of the back is accentuated and there is a tendency to lift the tail. In the final stages, the animal urinates copiously and frequently. It staggers badly when walking, the hind legs being straddled, apparently in an effort to maintain balance, and the sheep seems no longer able to judge the kind of obstacle it encounters when walking through yards or timbered country. It is not uncommon to see affected sheep pushing against rails, trees or fences and making little effort to go around them. When this stage is reached, the animal usually dies fairly soon, either from accident or apparently as a result of the weir vine poisoning.

Post Mortem: Post-mortem examination reveals little except slight patchy discolouration of the pyramidal zone of the kidney. The heart muscle is rather flabby. Microscopic examination of the kidney shows marked destructive changes, the tubules which flow through the pyramids being almost completely destroyed. This is probably sufficient to account for the marked loss of condition and the frequent urination. Symptoms indicate that there is functional disturbance of the brain as well.

Prevention: Further field studies indicate that the plant is poisonous even when dry, so that care must be exercised in pasturing sheep on weir vine country even after the vines are dead.

Acknowledgments.

In writing this account use has been made of many published papers and books. In particular, Miss Evelyn Hurst's excellent compilation, *The Poison Plants of New South Wales*, has been drawn upon freely. Unpublished data from the minutes of the Queensland Poison Plants Committee, the files of the Department of Agriculture and Stock, and the records in the Queensland Herbarium have also been used. Some of the observations are original.

Mr. G. R. Moule, Veterinary Officer (Sheep and Wool), has given valuable assistance on the veterinary side. Advice from Mr. C. T. White, Government Botanist, and from Mr. W. D. Francis, Botanist, is gratefully acknowledged. Mr. L. J. Webb. of the Council for Scientific and Industrial Research, has supplied references and other data and this, too, is appreciated. Most of the illustrations are original and thanks are accorded to Mr. W. J. Sanderson, Photographer, Department of Agriculture and Stock, for assistance with photographs.

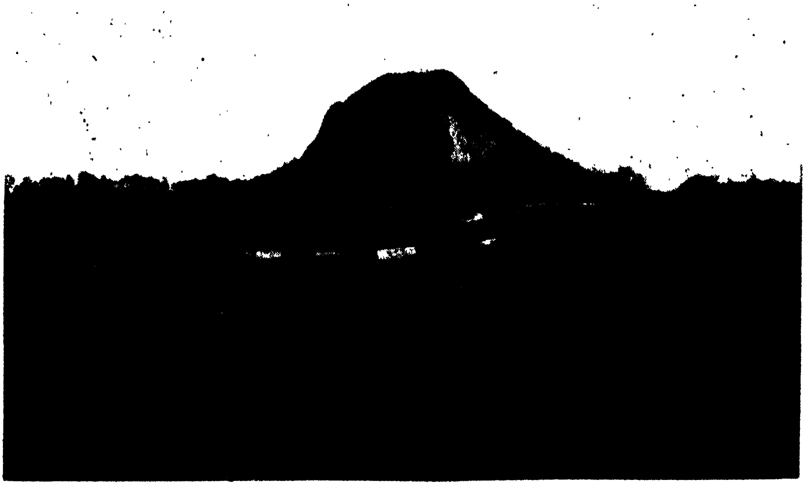


Plate 59.

IN THE GYMPIE DISTRICT, SOUTH QUEENSLAND.

PLANT PROTECTION

Recent Locust Outbreaks in South Queensland.

N. E. H. CALDWELL, Entomologist.

THE last serious outbreak of the Australian plague locust* occurred in 1937 and 1938 in various parts of southern Queensland—the Darling Downs and adjacent areas being the worst affected. Following this outbreak the pest declined in importance for some years. In the spring of 1945 locusts were again reported in the Maranoa district in the vicinity of Roma. The exact extent of the outbreak and the damage done were not clearly defined but the infestation apparently remained fairly localized. By the spring of 1946, the problem again threatened to become serious. Hopper bands were reported in several areas and, because at least one of these involved high-value agricultural lands on the Darling Downs, the outbreak attracted considerable attention. The two main areas affected were the Bowenville-Jondaryan section of the Jondaryan Shire and portions of the Waggamba Shire, near Goondiwindi.

The Bowenville-Jondaryan Outbreak.

Hoppers were reported in the first week in November, 1946. An investigation revealed that they were then in the fourth and fifth nymphal stages; hence hatching must have taken place early in October. Local inquiry revealed that flying swarms had been present in the previous April. These swarms undoubtedly laid the eggs from which the spring generation of hoppers emerged. The egg-beds were mostly located in hard, clay ridges along the banks of Oakey Creek to the south of Bowenville.

In the latter half of November, these hoppers matured and most of the resulting fliers migrated in a general south-easterly direction. During late November and December, a number of egg-beds were established in a tract of country about ten miles long and five miles wide to the south of Jondaryan. These gave rise to the main hopper bands of the next generation. Some fliers moved south, however, but only a small number of insignificant hopper bands developed in the areas invaded. Hoppers in the second generation were first reported at the end of December, but hatching had obviously started about the middle of the month. The infested country was seriously drought-stricken at the time and practically no green grass existed. The immediate threat was to a number of summer crops, mainly sorghum and panicum, which, though not specially attractive to grasshoppers, may, in the absence of other feed, be seriously damaged.

Because of this threat and also of the possibility that a subsequent locally-bred generation might damage early-planted winter crops, farmers in the district organized a control campaign, assisted by the Jondaryan

Shire Council acting in accordance with the provisions of "*The Plague Grasshoppers Extermination Act of* 1937." The position was complicated by an acute shortage of some ingredients in the standard poison bran bait and the small quantity of bait available was supplemented by oil spraying on a fairly large scale. When supplies of used engine sump oil (usually diluted with kerosene) were exhausted, large quantities of tractor fuel oil were employed.

The oil was applied partly by bucket pumps or stirrup pumps and partly by an improvised, power-driven spraying plant mounted on a truck, from which three men sprayed the hopper band from independent hoses as the truck was driven slowly through it. This contrivance worked reasonably well and was obviously a considerable improvement on the manually operated bucket pumps.

Farmers in this district gave a fine display of co-operative effort and a reasonably satisfactory job has been done in cleaning up this somewhat restricted outbreak. A number of small hopper bands were undoubtedly missed and, of course, some insects escaped from treated bands. The danger to existing crops was certainly averted, however, in most cases. Several factors tended to hamper operations, the main ones being:—

1. A rather late start in organizing the campaign.
2. The occurrence of a large number of small, scattered egg-beds rather than a small number of large, well-defined ones.
3. Desertion of the egg-bed site by the hopper bands very soon after hatching, a phenomenon presumably resulting from a shortage of food.
4. Rapid rate of movement of hopper bands, often with frequent changes of direction.
5. Difficulty of spraying hopper bands once they had invaded well-grown crops, though quite successful control was obtained in some cases under these circumstances.

The cost of the control campaign has been comparatively high. The somewhat spectacular, immediate effect of oil spraying is inclined to outweigh all other considerations in the minds of observers, but this method of treatment is obviously much more expensive than bran baiting. At a very conservative estimate, fifty gallons of oil are required to treat one acre of hoppers by the methods employed. With oil at approximately 1s. per gallon, the cost of materials alone is thus about £2 10s. per acre. On the other hand about 36 lb. of bran are sufficient to bait one acre. The current price of bran at Toowoomba is £7 11s. 4d. per ton, that is, slightly less than one penny per lb. Thus, making generous allowance for the arsenic pentoxide and molasses portions of the bait, the cost of materials for bran baiting could not exceed 5s. per acre. Where all labour is voluntary and unpaid, the cost of materials is the main item of expenditure. The advantages of bran baiting from this point of view are, therefore, very marked. Also much experience has shown that this method loses little, if anything, in comparison with others on the score of efficiency in killing hoppers, provided, of course, that the baiting is done properly in accordance with well-established principles.

The Goondiwindi Outbreak.

The Goondiwindi area is a notorious danger spot for outbreaks of the Australian plague locust. On this occasion, very dense swarms of fliers were reported in the third week in November. An investigation

showed that hopper bands had been present earlier in the spring, but did not attract much attention. However, these bands were almost certainly rather more extensive than at first admitted. Some interstate migration of flying swarms also took place, as this danger zone in Queensland is contiguous with a similar area in northern New South Wales.

The first hoppers of the second generation were reported in December. In subsequent weeks, large bands appeared at a number of points over a tract of country about 70 miles long by 30 miles wide. Much damage was done to grass on a number of properties and a few cultivated cereal crops were eaten out. Fortunately, tobacco crops were not attacked. Towards the end of January, swarms of fliers were again encountered though hoppers in various stages were still present in a number of places.

No district-wide control campaign was undertaken by the local authorities, the estimated cost being generally considered out of proportion to the value of the grass which could be protected. Complications were the difficulty of locating hopper bands on some of the larger holdings in this district and the risk of invasion by flying swarms from adjacent pastoral areas in which control measures cannot be applied efficiently. However, a number of graziers with valuable interests at stake applied control measures to hopper bands on their properties.

Other Areas Affected.

Various reports of locust activity were received from Roma, Dalby, and Leyburn. In the first-named area, between Roma and Injune, some damage was done to cereal crops. Otherwise little further was heard from these centres and it is assumed that the outbreaks did not reach serious proportions. An extreme shortage of feed resulting from severe drought conditions may have been at least partly responsible.

Prospects for the Immediate Future.

The autumn generation of hoppers is seldom as destructive as the earlier ones. During the wet months, conditions are inclined to be unfavourable for breeding and autumn bands are therefore not usually as extensive as those of the spring and mid-summer generations. Also, there is normally an abundance of feed following the wet season. In any case, control operations carried out in the Jondaryan Shire should ensure freedom from a serious infestation of the hopper stage in the next two months and the autumn generation of locally-bred fliers is unlikely to be extensive enough to give rise to a serious infestation in this area next spring. There remains the possibility of an invasion of fliers into agricultural areas of southern Queensland, from pastoral areas further west. Such an invasion in autumn could lead to outbreaks of hopper bands during spring.

Good February rains in all affected districts will ensure recovery of eaten-out pastures and an abundance of grass at least until the winter. Any flier swarms or hopper bands appearing in the autumn should not make serious inroads into the grass reserves, while cultivated crops are less likely to attract the pest's attention when grass is plentiful.

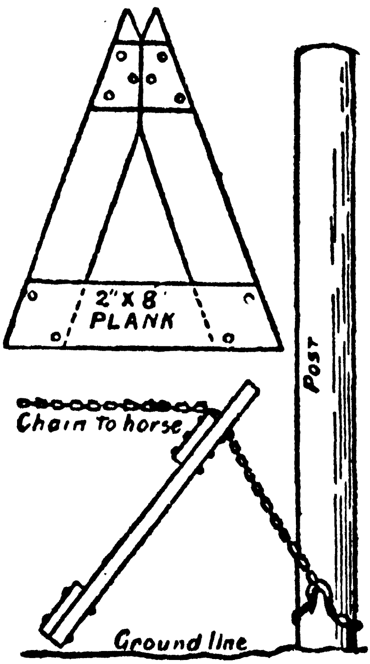
Need for Early Reporting of Outbreaks.

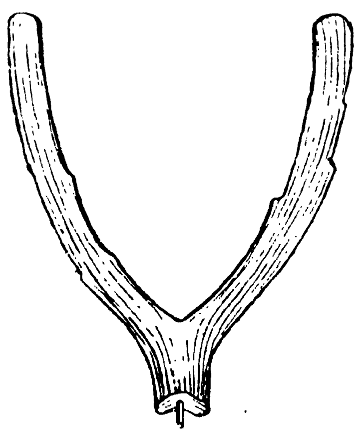
Although a locust* control campaign may be impracticable in pastoral areas, it is usually well repaid by results in agricultural districts. The responsibility of organizing control measures lies with the local authorities. The functions of the Department of Agriculture and Stock are to co-ordinate reports, to assess the extent of outbreaks and the practicability of undertaking control measures, and to give technical advice on methods of control and other points. The authorities concerned can perform their various functions efficiently only if they have adequate warning of an outbreak. An early start is an essential requirement of control operations. Landholders are therefore urged once again to report immediately to the nearest officer of the Department, or to their Shire Office, unusual activity on the part of any species of plague locust or grasshoppers.

* *Chortoicetes terminifera* Walk. The term "locust" is applied to this and some other migratory species; grasshoppers do not migrate.

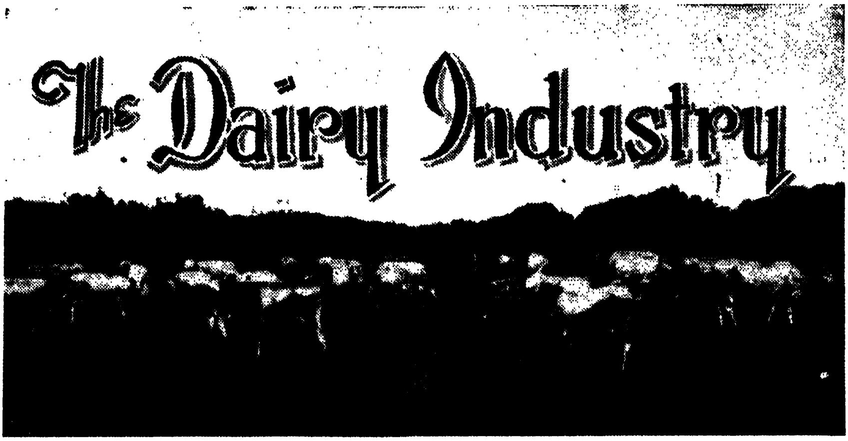
HOW TO LIFT AN OLD FENCE POST.

Taking out an old fence post is often a difficult job. A device like the one illustrated will enable a horse to get an almost vertical pull. The same idea can be applied by using a fork of a tree, cut as shown in the sketch on the right. In the base of the forked branch a notch is cut and a piece of round iron, such as a headless bolt, is driven into the centre of the notch. A link of the draw chain is pulled over the spike to prevent the chain from slipping as the horse takes the strain to pull out the post.





—From "*Handy Farm and Home Devices and How to Make Them.*"
(*J. V. Bartlett for War Blinded Association, Adelaide, S.A.*), 1946.



The Cooling of Milk on the Farm.*

F. G. FEW, Dairy Technologist (Engineering).

RAPID deterioration in the quality of milk produced on the farm soon follows unless means are available for its immediate cooling while milking is in progress.

The milk entering the vat from the milking machine will be found to have a temperature around 95 degrees F., which is generally about 20 degrees F. or so above the atmospheric temperature at the time of milking. It will be seen, therefore, that the milk would tend to fall in temperature if allowed to stand, but the cooling rate is so slow as to be useless for safeguarding quality. The problem then is to devise some means to ensure rapid cooling.

After considerable experimental work, cooling with recirculated water has been found to be very effective. Details of this system have already been published.† By this method the milk is allowed to gravitate slowly over a tubular surface cooler through which recirculated water is continuously forced by a small centrifugal pump driven from the dairy house mainshaft. As the water becomes warmed up by the milk it is essential to provide for its continuous cooling, and this is the purpose of the 12 ft. high by 4 ft. square water-cooling tower. During its passage from the top of the tower to the shallow pit beneath, the water is cooled to or near the existing wet-bulb temperature, the value of which depends on existing atmospheric conditions. For most of the dairying districts of the State the wet-bulb temperature is not appreciably over 70 degrees F., even under summer conditions, while for the remainder of the year it is generally very much below this value. As a result milk can be cooled by this method to around 70 degrees F., even during hot weather, and this represents a temperature drop of about 25 degrees F. in a very short interval of time. This technique is already in very extensive use in the Beaudesert area, one of the districts supplying whole milk for the metropolitan area.

Another type of milk cooler was designed recently with the object of cooling the product while milking is in progress. Although employing

* A Country Hour. Radio talk, A.B.C. (4QR).

† *Queensland Agricultural Journal,* May, 1946.

similar principles, the milk is cooled directly by this method without the use of water as an intermediate agent. Tests have shown, however, that the model first developed has not sufficient cooling capacity to be generally applicable, although up to its limit comparable results to those obtained by the earlier described method do result. The designer has undertaken to construct a larger unit and further tests are likely in the early future. Briefly, the method consists of feeding the milk from the vat into an inverted and enclosed dome in which it is met by an upward draught of filtered air. This is provided by a fan unit which can be driven from the dairy house mainshaft with the absorption of a minimum of power. The air causes the milk to be dispersed in a fine spray and this results in its being cooled by partial evaporation to a temperature which can be as low as the wet-bulb temperature under existing atmospheric conditions. It is also claimed that such extensive aeration tends to remove objectionable weed and feed flavours to some degree. This claim has not so far been finally substantiated, but preliminary tests would indicate definite possibilities with regard to at least feed flavours.

Methods capable of cooling freshly drawn milk to about 70 degrees F. have now been described. This temperature drop of approximately 25 degrees is the minimum that can be anticipated, as it applies only to the hottest weather. During the cooler months temperatures much below 70 degrees F. will be realized, the actual values obtained being dependent on local atmospheric conditions.

Generally, the degree of cooling possible will be quite satisfactory for milk for cheese manufacture, especially in areas on the Darling Downs, where conditions are good because of the usually low relative humidity. For milk for the whole milk trade, however, the best results are obtainable only by the additional use of refrigeration in conjunction with one of the methods earlier described.

In this connection, production of suitable farm refrigeration units has already been commenced. These are being sponsored by the Queensland Butter Board and will provide farm refrigeration for a minimum outlay. Two models have so far been developed to hold four and six cans, respectively, each can being of the common 10-gallon capacity. In these, the cans of milk already cooled to at least 70 degrees F. are placed in a tank containing water chilled to 33 degrees F. Agitation of the chilled water by the use of sprays results in the temperature of the milk falling 20 degrees F. within one hour, resulting in a temperature one hour after milking not exceeding 50 degrees F. even during the hottest months of the year. These units can be recommended for farmers wishing to hold the night's milk for delivery the following morning, but are not normally an advantage if a twice-daily delivery service exists. One important additional feature, however, is the inclusion within the refrigerator unit of a cabinet for household purposes. All the advantages of domestic refrigeration are thus available to the farmer's wife without interfering with the primary purpose of the installation, namely, the cooling and cold storage of all milk produced on the farm.

When the summer conditions in most dairying districts of Queensland are considered, the necessity of taking every care of such a perishable product as milk becomes obvious. The methods described have this object in view, enabling every satisfaction to be obtained with the bare minimum of initial outlay.

Field Day at Mount Mee.

LOOKING back and around over the Pine River Valley from points of vantage on the gradually ascending winding road from Dayboro' to Mount Mee, the wayfarer is rewarded with a view of one of the finest panoramas in Queensland, of a countryside renowned for its scenic beauty as well as for its dairy productivity. The reward is even greater when the summit is reached. Mount Mee is 40 miles from Brisbane, and from its rich surrounding pasture land comes a large volume of the metropolitan daily milk supply.

Arranged by the district branch of the Queensland Dairymen's Organization in association with the Department of Agriculture and Stock, the farm field day at Mount Mee on 10th February was a notable local event. Mr. A. H. Duncan's fine property was the venue and there were gathered many district farmers and the senior pupils from the nearby State school, who, in the course of the proceedings, learnt much of the value of the advisory services now available to the primary producer through the Department of Agriculture and Stock. Mr. E. Sutherland, Dairy Machinery Adviser, was the chief speaker. He lectured lucidly and interestingly on the care and maintenance of separators and milking machines, using models and Mr. Duncan's dairy equipment to illustrate his instructional address. Mr. S. A. Clayton, Dairy Officer of Caboolture, assisted in the demonstrations.

Mr. Sutherland stated that the dairy machinery service instituted by the Department was designed to assist the producer to attain the highest degree of efficiency in the operation of his plant. Speaking of the importance of the separator in the production of choice quality cream, he said that incorrect installation was often the cause of poor performance of a machine. Although it might seem a trifling fault, if a separator were not dead level much avoidable wear would be caused in its moving parts. Wrong grades of oil also were among the causes of wear. Incorrect speed was a cause of variation in cream tests. Slipping belts tended to vary the speed, and as a separator bowl revolved 7,000 times per minute, the resultant jerkiness caused excessive wear, with a consequent test variation. Other causes of impaired machinery performance were described in detail.

Dealing with the operation of the milking machine, Mr. Sutherland pointed out that a high vacuum pressure was a prevalent cause of mastitis in dairy cows. It was necessary that the vacuum gauge should be tested regularly. The importance of proper care of the rubber equipment was stressed. Any incorrectness of adjustment caused leaks in the system. As there was frequently only a narrow margin between choice and first grade cream, Mr. Sutherland impressed on his hearers that attention to the points he had mentioned would mean higher grades and better returns. Correct supervision of a dairy plant paid a dividend, and the additional amount of care necessary should become part of the dairy routine. Co-operating with the technologist and the technician, the producer could attain the height of efficiency in dairy production.

Similar field days have been arranged for every dairying district in the State; those already held have proved of definite advantage to the industry generally.

Plate 60.
DAIRY MACHINERY FIELD DAY ON MR. A. H. DUNCAN'S FARM AT MOUNT MEE.—Group of interested farmers and school children.

Plate 61.
JUNIOR FARMERS OF MOUNT MEE.—They showed intelligent interest in both the lecture and the practical demonstrations.

Plate 62.
THE LECTURER DEMONSTRATES A POINT IN MILKING MACHINE OPERATION.

Plate 63.
THE LECTURER PAUSES TO HEAR A QUESTION ON HOW TO CHECK A LEVEL.

The PIG FARM

Are Heavier Pigs More Profitable than Light?

B. R. MARTIN, Adviser, Pig Branch, Toowoomba.

IT is a well-known fact that young pigs make larger gains than older ones for the same amount of food. This applies both to liveweight gains and dressed weight gains for pigs over 100 lb. liveweight. The following table illustrates this clearly.

TABLE 1.

Liveweight Range.	Food for 1 lb. Liveweight Gain.	Food for 1 lb. Carcase Gain.	Per Cent. Dressed Carcase.	Offal.	Carcase Gain for Range.
Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
		SERIES 1.			
50–100 ..	4·0	5·15	77·7	22·3	77·7
100–150 ..	4·37	5·07	81·0	6·2	43·8
150–200 ..	4·82	5·23	83·4	4·7	45·3
200–250 ..	4·98	5·48	85·0	4·3	45·7
250–300 ..	5·11	5·43	86·4	3·0	47·0
		SERIES 2.			
150–200 ..	4·18	5·03	76·7	9·0	41·0
200–250 ..	4·58	5·38	78·0	7·5	42·5
250–300 ..	5·10	5·93	79·3	7·2	42·8
		SERIES 3.			
Birth–100 ..	3·04	3·91	77·7	22·3	77·7
100–200 ..	3·59	4·0	83·4	10·9	89·1

But in Queensland it is dressed weight, not liveweight, that we are concerned with, as pigs are sold for slaughter at "so much per lb. dressed weight." Pigs consigned to factories are paid for according to actual dressed weight; those sold to factory agents over the scales are paid for according to estimated dressed weight using a chart; and at auction sales the buyer makes his price estimate according to his personal estimate of the dressed weights.

An examination of Table 1 shows that there is a greater range in the figures of the "liveweight gain" column than in those of the corresponding "carcase gain" column. It will also be seen that the heavier the pig, the higher the dressed carcase percentage.

This suggests that despite the cheaper liveweight gains in young pigs, the greater percentage of carcase developed in older pigs (with less waste as offal) may counteract this to such an extent that there is greater profit in feeding pigs to heavy weights. In fact this appears to be the case.

A recent United States Department of Agriculture Bulletin presents evidence of this. It is based on an analysis of 12 experiments involving 813 pigs. The object has been to find at what weights pigs should be sold to give the greatest return for food given to them.

There are three ways of looking at this problem, if we ignore the question of prices ruling for the sale of pigs:—

(1.) If we total separately the food used in raising pigs to various weights and find the pounds of food required to produce 1 lb. of live pig in each case, at what weight would the least food be used per pound of live pig? These totals must include food used for the dry sow. (See Table 2.)

(2.) Using the total in (1) then at what liveweight would the least food be used per lb. of dressed carcase?

(3.) Using this total again, at what liveweight would the least food be used per lb. of edible product produced?

The answers to these 3 questions were found to be:—

(1.) 130—200 lb. liveweight.

(2.) 225—275 lb. liveweight.

(3.) At some weight greater than 175 lb. liveweight.

TABLE 2.

Liveweight Range.	Food for 1 lb. Liveweight Gain.	Food for 1 lb. Liveweight Gain. Corrected for Weight.
Lb.	Lb.	Lb.
0– 35 ..	7·66	4·85
35– 50 ..	3·4	4·54
50–100 ..	3·5	4·12
100–150 ..	3·84	4·04
150–175 ..	4·18	4·04
175–200 ..	4·28	4·07

The answer to question (1) is perhaps the most surprising, but can be readily explained by reference to Table 2. It is seen that the food required for 1 lb. gain in early life is 7.66 lb., which seems quite ridiculous. However, approximately 150 lb. of food which has been fed to the sow while dry and during growth (part only of her food) must be added to the cost of raising each pig in the litter. As it has already been used it is included in the first period of the young pig's growth.

Looking across to the 3rd column (corrected weight) the corresponding figure is only 4·85 lb. This is because an adjustment has been made which takes care of the sale value of the sow and the boar; therefore, in this case 20·3 lb. is added to the liveweight of the market pig before working out the food used per lb. liveweight gain.

Similar adjustments are made in obtaining the answers to questions 2 and 3, being 16·9 lb. dressed weight and 15·4 lb. edible product, for which figures are shown in Table 3.

TABLE 3.

Liveweight Range.	Food for 1 lb. Carcase. Gain Corrected.	Food for 1 lb. Edible Products. Corrected.
Lb.	Lb.	Lb.
150–175 ..	5·33	6·76
175–200 ..	5·31	6·63
200–225 ..	5·30	6·53
225–250 ..	5·33	6·47
250–275 ..	5·33	6·42

It is quite easily seen then that from the standpoint of quantities of food used, the most economical pig is one sold at much heavier weights than was formerly supposed. It is also quite obvious that the man who sells store pigs and weaners stands to lose more than anyone else, unless of course he gets more than equivalent bacon price per pound.

There are also many supporting factors which force the conclusion that the most profitable pig for the farmer is a heavyweight, provided, of course, his grading is good.

(1.) Heavier pigs make better use of roughage.

(2.) More tons of pigmeat can be sold with the same equipment and capital outlay.

(3.) Labour cost per ton of meat produced is less.

(4.) The percentage of losses in young pigs, per ton of meat sold, is less.

(5.) There is less shrinkage on curing in heavy pigs and a smaller loss when trimming.

(6.) As seen by the figures for "edible product" in Table 3 the average gains are increasingly economical up to a liveweight over 275 lb. This is of importance to all shareholders in co-operative factories, because profits ultimately depend on the proportion of edible products available for sale to the public.

(7.) As the known dressing percentages of pigs of various weights range from 65 per cent. to 80 per cent., the advantage in many cases will be greater than indicated by the tables.

The chart used by bacon factories in Queensland for buying over the scales covers the range from 66 per cent. for pigs of 150 lb. to 73 per cent. for pigs at 250 lb.

An experiment with 75 pigs, all of one breed and from one farm, showed dressed weight percentages of 66 per cent. for 130 lb. pigs and 74·5 per cent. for 190 lb. pigs.

Where the variation in percentage dressed weight is so much greater than in the tables, a still greater profit from the heavyweight pig can be expected.

ANIMAL HEALTH

Cattle Lice.

F. H. S. ROBERTS, Animal Health Station, Yeerongpilly.

THERE are few districts in Queensland where lice are not serious on cattle at some time or other. Both dairy and beef cattle of all ages are affected. The pests are most troublesome during the winter and spring when the pastures are dry and the animals poor in condition. Heavy infestations may sometimes be seen also at other times of the year, and in such cases are associated either with drought or general unthriftness. Animals which are stabled for any considerable length of time may also carry large numbers of lice. The conditions under which lice become serious are not fully known, but are thought to be associated with the condition of the skin and coat. It is known that the heavy infestations which occur during dry seasons dwindle to insignificant proportions shortly after good rains have fallen.

Lice feed upon the tissues of the host. They cause considerable irritation, and to relieve this the animal scratches and rubs itself against any convenient object. As a result, there is a marked loss of hair, the skin becomes scaly, and large sores and scabby areas are formed. Cattle are unable to feed and rest to the normal extent. The final effect is a loss of condition, which at times can be severe. The infestations are all the more serious as they usually occur during dry times, when cattle find it difficult to secure sufficient nourishment for their own bodies without feeding large numbers of lice as well. Lice, by lowering the vitality of an animal, also render it more susceptible to inclement weather conditions and to other diseases. Thus the damage and loss caused by lice are sufficiently serious to warrant careful consideration and the application of efficient treatment.

SPECIES OF LICE.

Five species of lice are found on cattle. Four of these are sucking lice—namely, the buffalo louse (*Hæmatopinus tuberculatus*), the short-nosed louse (*Hæmatopinus eurysternus*), the long-nosed louse (*Linognathus vituli*), and the tubercle-bearing louse (*Solenopotes capillatus*). Sucking lice have a pointed head. The mouth-parts are terminal in position, and are tubular to enable the insect to pierce the skin and suck up the blood and fluids on which it lives. The fifth species is a biting louse (*Damalinia bovis*). Biting lice have a broad, squarish head. Their mouth-parts are built only for biting and chewing and are placed on the under surface of the head. Biting lice live on the scales, scurf, and other material which is found on the skin surface.

Sucking Lice.

The Short-nosed Louse.—Of the four species of sucking lice, the short-nosed louse (Plate 64) is the most prevalent and the most serious. It is a comparatively large louse, up to one-eighth of an inch in length.

The head is about as broad as long, and the three pairs of legs are all about equal in size. When the louse is alive, the head and thorax are yellow-brown in colour and the abdomen a greyish-blue. This louse has a very wide distribution throughout the State, and is most usually found on grown cattle.

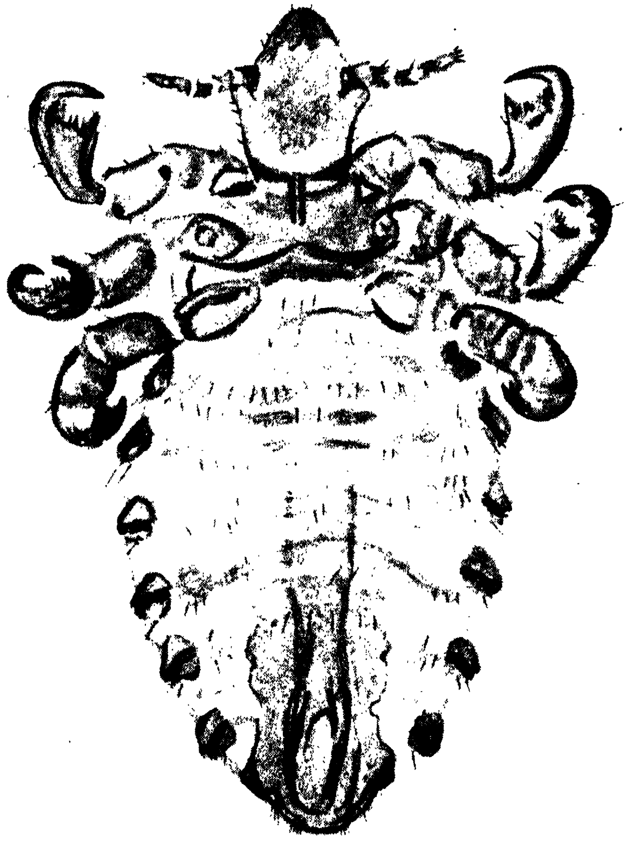


Plate 64. [I. W. Helmsing.

THE SHORT-NOSED CATTLE LOUSE (*Hæmatopinus eurysternus*) × 48.

The Buffalo Louse.—The buffalo louse is known to occur on cattle in the Gulf districts. It is not very common and is probably not a serious pest. This species is very similar in general appearance to the short-nosed louse, from which it can be distinguished only by microscopic examination.

The Long-nosed Louse.—This species (Plate 65) is next in prevalence and importance to the short-nosed louse. It is usually found on young cattle, but is by no means uncommon on grown animals, especially dairy cattle. It has the same general colouration as the short-nosed louse, but

is smaller and more slender in appearance. The head is long and narrow, being much longer than broad, and the forelegs are smaller than the middle and hind legs.

The Tubercle-bearing Louse.—This louse gets its common name from the position of the abdominal spiracles or breathing pores, which open on small laterally-placed tubercles (Plate 66). It is the smallest of the sucking lice, and is only about half the size of the short-nosed louse. It has a short, bluntly-rounded head, and, as in the long-nosed louse,

Plate 65. [*I. W. Helmsing.*

THE LONG-NOSED LOUSE (*Linognathus vituli*) × 48.

the forelegs are smaller than the middle and hind legs. This louse is probably a comparatively recent introduction into Queensland, but is now well distributed over the southern part of the State.

Habits and Life History.—Sucking lice feed in groups or clusters and are usually found on the top of the head, around the eyes, on the neck, brisket, withers, rump, tail, inside the thighs, and on the scrotum or udder. The most favoured sites are those from which the animal has most difficulty in dislodging them. Their habit of feeding in groups, and the fact that they feed by piercing the skin, make sucking lice more serious than biting lice.

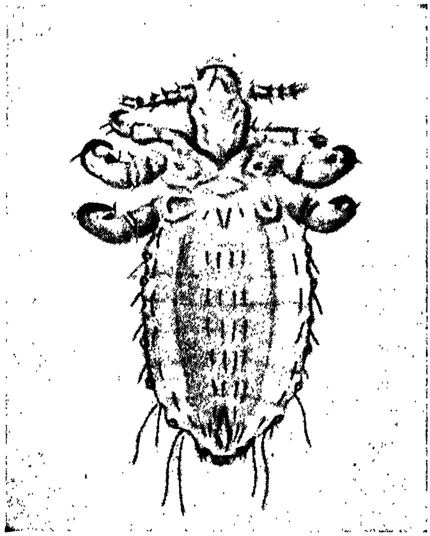


Plate 66. [I. W. Helmsing.

THE TUBERCLE-BEARING LOUSE (*Solenopotes capillatus*) × 48.

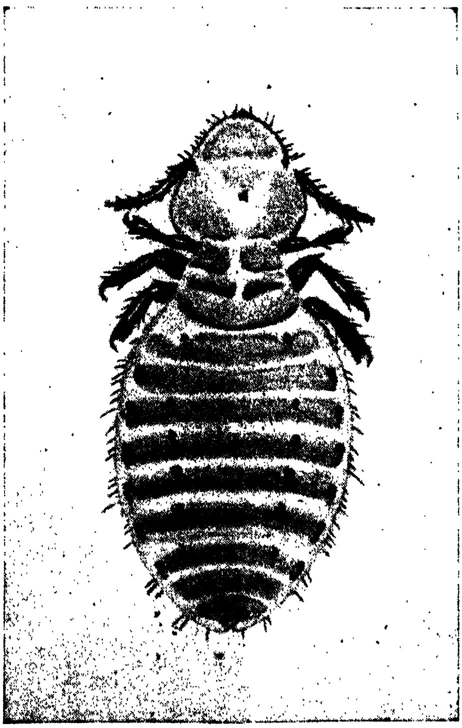


Plate 67. [I. W. Helmsing.

THE BITING LOUSE (*Damalinia bovis*) × 48.

The female louse attaches her eggs or "nits" to the hairs of the coat, usually low down near the skin. The eggs of the short-nosed louse hatch in 11 to 18 days. The young lice differ from their parent chiefly in size, and in about 12 days after hatching are mature and commence laying eggs. In the case of the long-nosed louse, the eggs hatch in 10 to 14 days, and 11 days later the lice mature. The eggs of the tubercle-bearing louse hatch in 10 to 13 days.

Biting Louse.

The biting louse (Plate 67) is not uncommon, but is neither as prevalent nor as important as either the short-nosed or the long-nosed species. It is a small louse, with a broad, blunt, reddish head and a yellowish-white abdomen. The shape of the head readily distinguishes it from the sucking lice. It may occur on cattle of all ages.

Habits and Life History.—Biting lice are found most commonly on the top of the head, on the neck, shoulders, withers, along the back, hips and rump. Although not considered as serious as sucking lice, when sufficiently numerous they are capable of causing considerable irritation and annoyance. The eggs, which are glued to the hairs, hatch in about nine days, the young lice reaching maturity about 14 days later.

TREATMENT AND CONTROL.

Lice live and breed only upon the body of the animal. Occasionally they may become detached from the host, in which case biting lice are said to live as long as seven days and sucking lice about four days. It is possible, therefore, that there may be a risk of infestation from yards and stables which have held lousy cattle; but the chief manner by which lice spread is by contact. By treating infested animals, the infestations can be controlled and, if the treatment is carefully carried out, completely eradicated.

There are several insecticidal materials available which, if used according to directions, will give satisfactory control. These may be applied either by dusting, washing, spraying, or dipping.

Dusting.

Of the various dusting powders that have been tested, a DDT dust in pyrophyllite, at a concentration of 5 to 10 per cent. DDT, is the most effective. One application will kill both biting and sucking lice and will give control over a period of one to three months. Sufficient DDT remains on the animal to destroy any lice hatching from the eggs, which are not affected by this insecticide.

Another effective dust can be made by mixing 1 part of phenothiazine and 2 parts of sodium fluosilicate with 5 parts of flour. At least two treatments with this dust are necessary with a 14-16 days' interval between them.

Dusts are applied by means of a shaker and *rubbed well into the coat by hand,* paying particular attention to the under side of the animal.

Spraying or Washing.

Where small herds are to be treated, aqueous solutions or emulsions may be satisfactorily applied by spraying or washing.

A stirrup pump or knapsack spray is suitable for spraying. The animals must be thoroughly wetted and for this a good pressure in the pump and 2 to 3 gallons of fluid per head are necessary.

In washing, the fluid is applied to the body by means of a cloth or brush.

DDT

Emulsions or suspensions of this material containing 0·25 to 0·5 per cent. DDT will kill both biting and sucking lice and are said to give control for up to three months.

Nicotine Sulphate.

This material should be used at the rate of 5 cubic millilitres (about ⅙ fluid oz. or 2 teaspoonfuls) to a gallon of water. At this concentration it will kill both biting and sucking lice, but will not harm the eggs. At least two treatments, therefore, are required after a 14-16 days' interval.

Arsenic.

Arsenical dipping fluids will control biting lice only. At least two treatments are necessary at an interval of 14-16 days.

Dipping.

DDT

Dipping vats containing 0·5 per cent. DDT, as recommended for cattle tick control, will eliminate both biting and sucking lice for periods up to three months.

Arsenic.

As previously mentioned, arsenical dipping fluids will control biting lice only. If nicotine sulphate is added to the dip at the rate of 1 gallon for every 900 gallons of dip, sucking lice will also be killed. At least two dippings at an interval of 14-16 days are essential for eradication.

The best time for treatment is during the autumn or early winter, thus sending the cattle into the winter free from lice. The muster should be as complete as practicable, as any lousy animals that escape treatment can readily reinfest the rest of the herd. The beneficial effects of autumn dipping may be summed up in the words of a grazier whose cattle had suffered very severe infestations for many years, but who in the autumn of last year dipped twice—that "although the winter rainfall was well below average, the cattle wintered better than ever before."

Veterinary Medicines.

Veterinary Medicines Registered for the period January, 1945, to December, 1947.

List No. 2 (supplementary to List No. 1 issued on 19th July, 1946), published on 6th February, 1947, in accordance with Section 6 (7) of the Veterinary Medicines Acts.

A.C.F. & Shirleys Fertilizers Ltd., Little Roma street, Brisbane.
Andrew Dryden's Remedy for Scour in Calves.
Andrew Dryden's Liquid Blister for Horses and Cattle.

Carvosso, P. H., 28 Wienholt street, Auchenflower, Brisbane.
Worm Capsules.

Dalgety & Co. Ltd., Elizabeth street, Brisbane.
Sayers Green Seal Single Strength Fluke Drench.
Sayers Green Seal Double Strength Stomach Worm and Fluke Drench.

Embelton & Co., G. P., 196 Boundary street, Brisbane.
"Empress" Vitaminised Oil.

Harveyson, T. C., Dorrington drive, Ashgrove, Brisbane.
"Hypoloid" "Piroparv."

Leggo & Co. Pty. Ltd., A Victor, 185 Mary street, Brisbane.
"Vallo" Nicotine Sulphate.

Maclean Pty. Ltd., D., Charlotte street, Brisbane.
Baxter's Kidney & Bladder Tablets.
Baxter's Skin & Blood Pills.
Baxter's Stomach and Bile Pills.
Judge's Physic Balls.
Judge's Bot Bombs.
Judge's Colic & Gripe Drench.

McDonald & Co., A. H., 99-103 Mary street, Brisbane.
Vetamac Vaginitis Powder.

Morden Laboratories, 66 Charlotte street, Brisbane.
Morden Vitopet Tablets for Dogs and Cats.

Nicholas Pty. Ltd., 70-72 Eagle street, Brisbane.
Vetemul "A."
Vetemul "A" & "D3."
Sulpha-G.

Norris Agencies Pty. Ltd., 689 Ann street, Brisbane.
C.N. Disinfectant.
Sidolia Germicide.

Pilcher & Clarry Pty. Ltd., 329 Adelaide street, Brisbane.
Evans Ear Canker Ointment for Dogs.
Evans Veterinary Ringworm Ointment for Horses and Cattle.
Evans Worm Capsules for Small Toy Dogs and Puppies under 8 weeks old.

Poultry Farmers' Co-op. Society Ltd., Roma street, Brisbane.
"Red Comb" Worm Killer
"Red Comb" Roup Powder
"Red Comb" Eye Roup Treatment.

Queensland Pastoral Supplies Pty. Ltd., Bowen street, Brisbane.
Hart's Immunol Concentrated Bluestone and Nicotine Sulphate Drench.
Hart's Immunol Carbon Tetrachloride Fluke & Worm Drench —Single Strength.
Hart's Immunol Carbon Tetrachloride Fluke and Worm Drench—Double Strength.
Hart's Immunol Sulphur Antiseptic.

Surgical Supplies Ltd., 428 Queen street, Brisbane.
Bio Bot Bombs.
Bio Blackleg Pellets.
Bio Blackleg Cords.
Stewart's Liquid Blister.
Bio Blue Lotion (Hopple Chafe).
Bio Bowel Laxative for Dogs.
Surgical Supplies Dairy Ointment.
Bio Flukure Double Strength Carbon Drench.
Bio Healing Balsam.
Bio Titbalm.
Bio Healing Ointment.
Bio Painidine.
Bio Diuretic Powders.
Bio Gastric Mixture.
Bio Cough Electuary.
Bio Mange Ointment.
Bio Puppy Worm Syrup.
Bio Roupine.
Bio Greyhound Liniment.
Bio Blister Paste.
Bio Eye Powder.
Bio Tendonol.
Bio Canker Powder.
Stewart's Constitution Balls.
Bio Mastitis Toxiculture.

Taylors Elliotts Pty. Ltd., 150-160 Charlotte street, Brisbane.
Elliotts Phenzeen Plus.
Evans Blackleg F.W.C. Vaccine (Cattle).
Elliott's Enca.

Tudor & Petty, H. G., Russell street, Toowoomba.
T. & P. Vaginitis Powder.

INDEX OF BRANDS OR TRADE NAMES.

Brand or Trade Name.	Primary Dealer.
Andrew Dryden's	A.C.F. & Shirleys Fertilizers Ltd.
Baxter's	Maclean Pty. Ltd., D.
Bio	Surgical Supplies Ltd.
"Empress"	Embelton & Co., G. P.
Elliotts	Taylors Elliotts Pty. Ltd.
Evans	Pilcher & Clarry Pty. Ltd.
Evans	Taylors Elliotts Pty. Ltd.
Hart's	Queensland Pastoral Supplies Pty. Ltd.
Hypoloid	Harveyson, T. C.
Judge's	Maclean Pty. Ltd., D.
Morden	Morden Laboratories.
"Red Comb"	Poultry Farmers' Co-op. Society Ltd.
Sayer's	Dalgety & Co. Ltd.
Sidolia	Norris Agencies Pty. Ltd.
Stewart's	Surgical Supplies Ltd.
T. & P.	Tudor & Petty, H. G.
"Vallo"	Leggo & Co. Pty. Ltd., A. Victor
Vetamac	McDonald & Co., A. H.

F. B. COLEMAN,
Registrar of Veterinary Medicines.
Brisbane, 6th February, 1947.

QUEENSLAND SHOW DATES FOR 1947.

April.

Chinchilla ... 1st and 2nd
Miles ... 9th and 10th

May.

Kingaroy ... 1st, 2nd, and 3rd
Mount Perry ... 3rd
Marburg ... 3rd
Goondiwindi ... 3rd and 5th
Eidsvold ... 5th and 6th
Taroom ... 5th, 6th, and 7th
Yarraman ... 5th and 6th
Monto ... 7th and 8th
Roma ... 7th and 8th
Nanango ... 8th, 9th, and 10th
Beaudesert ... 7th, 8th, 9th, and 10th
Blackall ... 13th and 14th
Kilkivan ... 16th and 17th
Ipswich ... 13th to 16th
Wondai ... 15th, 16th, and 17th
Charleville ... 21st and 22nd
Gayndah ... 21st and 22nd
Murgon ... 22nd, 23rd, and 24th
Esk ... 22nd, 23rd, and 24th
Warrilview ... 23rd
Goomeri ... 27th and 28th
Biggenden ... 29th and 30th
Gympie ... 29th, 30th, and 31st
Kalbar ... 30th
Blackbutt ... 30th and 31st

June.

Maryborough ... 5th, 6th, and 7th
Boonah ... 6th and 7th
Childers ... 9th and 10th
Gladstone ... 16th and 17th
Bundaberg ... 12th, 13th, and 14th
Lowood ... 13th, 14th, and 16th
Gin Gin ... 16th and 17th
Rockhampton ... 18th to 21st
Toogoolawah ... 20th and 21st
Mackay ... 24th, 25th, and 26th
Proserpine ... 27th and 28th

July.

Charters Towers ... 1st, 2nd, and 3rd
Kilcoy ... 3rd and 4th
Ayr ... 4th and 5th
Townsville ... 8th, 9th, and 10th
Rosewood ... 11th and 12th
Nambour ... 17th, 18th, and 19th
Gatton ... 18th and 19th
Cairns ... 22nd, 23rd, and 24th
Crow's Nest ... 30th and 31st
Laidley ... 25th and 26th
Innisfail 31st, and 1st and 2nd Aug.

August.

Lawnton ... 2nd
R.N.A., Brisbane ... 9th to 16th

September.

Rocklea ... 13th
Beenleigh ... 19th and 20th

GENERAL NOTES

The Brisbane Milk Board.

An Order in Council has been issued under *The Milk Supply Act* of 1938 constituting the fourth Brisbane Milk Board for the period from 1st February, 1947, to 31st January, 1950.

Mr. E. H. Lindsey, Officer in Charge of the Commonwealth Prices Branch, has been re-appointed Chairman of the Board. Messrs. R. L. Harrison (Gleneagle), J. N. Scott (Camp Mountain), and A. C. Vores (Brisbane) are the elected representatives of the milk producers; and Messrs. G. Andrew (Petrie Terrace), A. E. Jameson (Windsor), and T. F. Plunkett, M.L.A. (Beaudesert), are the representatives of the wholesale vendors.

The Queensland Dairymen's State Council Regulations.

The Dairymen's State and District Council Regulations of 1946 issued under *The Primary Producers' Organisation and Marketing Acts* have been rescinded, and new Regulations to be known as *The Queensland Dairymen's State Council Regulations* have been issued in lieu thereof.

These Regulations give effect to the objects, powers and functions of the Queensland Dairymen's Organisation of which components are the Queensland Dairymen's State Council, District Dairymen's Councils, and Local Dairymen's Committees.

Provision is made for the making each year by the Queensland Dairymen's State Council of a levy to provide funds for administrative purposes. The amount of the levy for the year ending 30th June, 1947, is 16s. in respect of each producer.

The Regulations also provide for the election of members of district dairymen's councils, the election of the chairman and vice-chairman of each council, and election of the president and vice-president of the Queensland Dairymen's State Council.

Standing Orders for the conduct of business at meetings of the Queensland Dairymen's State Council, the District Dairymen's Councils, and the Local Dairymen's Committees are outlined.

Provision also is made for the holding of annual conferences of dairymen in the various districts of the State.

An Order in Council under *The Primary Producers' Organisation and Marketing Acts* empowering the Queensland Dairymen's State Council to engage staff and employ agents as necessary for the carrying out of the objects of the organisation has been approved.

The Veterinary Surgeons Board.

Appointments to membership of the Veterinary Surgeons Board of Queensland for a period of three years, as from the 28th February, are:—

Mr. E. F. E. Sunners (Deputy Controller of Meat Supplies), Dr. J. Legg (Acting Director, Division of Animal Industry, Department of Agriculture and Stock), (Government Representatives);

Messrs. J. C. J. Maunder (Acting Chief Inspector of Stock, Department of Agriculture and Stock), and K. M. Lucas (Veterinary Surgeon, Kitchener Road, Ascot).

Mr. R. P. M. Short, Under Secretary of the Department of Agriculture and Stock, is Chairman of the Board.

Rural Topics

Rear View.

Here is a good tip discovered by accident. A farmer of Wisconsin installed a rear view mirror on his tractor when he was travelling on the highway to town. He did not remove the mirror from the tractor, and when next ploughing found that there was no need to turn round and watch the furrows.

Bloat in Cows—Some Common Causes.

Bloat, or hoven, in cows is caused by succulent foods eaten under certain conditions, which cause the formation of large quantities of gas in the rumen or paunch, and in consequence a swelling of the left flank. It is more often seen—

When cattle are turned hungry on to such succulent green food as lucerne, clover and trefoil. When cattle accustomed to dry feed are suddenly changed on to soft green food. When travelling cattle are allowed free access to large amounts of green food such as variegated thistle. When cattle gorge themselves on wet grasses or herbage. When cattle are fed on some roots or potatoes under certain conditions, chiefly in the raw state, or should they become stuck in the gullet.

Such poisonous plants as hemlock and deadly nightshade may cause acute hoven. Again, hoven may be often seen in cattle where rumination has ceased, as in dry bible. Some cattle seem to be more subject to hoven than others.

Every effort should be made to prevent the occurrence of hoven in stock by guarding against the predisposing causes. In feeding lucerne, clovers or trefoils, if the animals are not used to such fodders they should be put on to them gradually until they become accustomed to them. If lucerne is fed when wet, especially after heavy rain (when it is soft and juicy), it will almost always cause trouble, and cattle should, therefore, be kept off it until it is drier.

Driving animals which have been feeding on these succulent foods should be avoided.

In all acute cases of bloat, no matter what form of treatment is adopted, it should not be delayed, as the animal's life will depend on the quick removal of the gases.

Value of Goats' Milk.

The milk of the goat is highly nutritious and, although the flavour is slightly different from that of cows' milk, it is frequently difficult to detect this difference if the goats are properly fed. All milk undergoes a process of curdling in the stomach; with cows' milk the curd is large, hard and tough, while the curd of goats' milk is small, light and flocculent, so that digestion is greatly facilitated. Goats' milk has a high butterfat content—approximately 5 per cent. The fat globules are much smaller than in cows' milk and do not rise readily to the top of the milk in a distinct layer, but the fat is readily separated by the ordinary separator.

The butter made from goats' milk is white, though otherwise of the same appearance and taste as butter made from cows' milk and, when artificially coloured, is indistinguishable from it. Goats' milk is also very suitable for making cheese, and is used very largely for this purpose in Switzerland.

The value of goats' milk for feeding infants and children is well known and its use is strongly recommended by the medical profession for this purpose. Goats' milk is said to be digested in the human stomach in twenty minutes, this being due to the fine curd and the fact that the small fat globules are easily assimilated. For ordinary use goats' milk can be taken fresh and in its raw state, with every confidence in its purity and high nutritive value. Tuberculosis in the goat is almost unknown, especially in Queensland, and there is no record in this State of undulant fever being contracted from goats' milk.

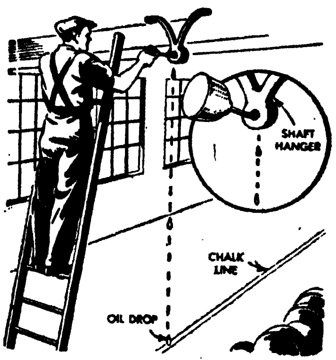
GADGETS AND WRINKLES

ALIGNING RELATIVE POSITIONS ON ROOF AND FLOOR.

This is a very novel and useful idea for occasions when it is necessary to judge the exact relative positions of objects on roof and floor.

For instance, to adjust overhead shaft-hangers to the relative position of any machine which may be set on the floor beneath them, draw a chalk line on the floor to indicate the desired location of the shafting and then drop oil from the hanger to determine when it is in proper alignment.

If there is no air current to deflect the drops, this method is very accurate and can be used for quite a number of other occasions when relative positions on roof and floor are required.

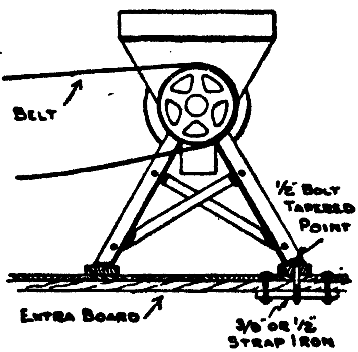


ANCHORING A FEED GRINDER.

Nail an extra board lengthwise of the joints underneath the floor, and under it bolt a piece of ⅜ in. strap iron. Tap it to take a ½ in. bolt tapered at the point so that it will centre itself in the hole.

In this way, you can line up the hole in the grinder support with the one in the floor.

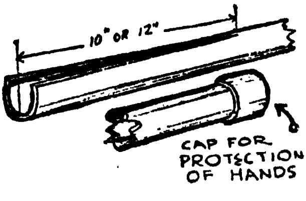
Drop the tapered bolt into the hole and screw it down. You can do this without having to crawl under the barn to screw nuts on to the bolts.



A HOME-MADE BLASTING TOOL.

This is a tool made by one farmer with satisfactory results. It is made from a piece of 1¼ in. pipe and it was found very effective for digging holes under stumps for blasting powder.

Take a piece of pipe not over 1¼ in. inside dia. and split it back on one side with a hacksaw for 10 or 12 inches, then spread the split edges apart. The pipe used in this instance was 5½ ft. long and was found excellent for getting holes under stumps where the roots were too close together to dig between them with a larger tool. The other end of the pipe should have a coupling on it to protect one's hands, or gloves.



The items on this page have been extracted from "Handy Farm and Home Devices and How to Make Them," a recent notable work by J. V. Bartlett published in Adelaide on behalf of the War Blinded Association.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

YOUR CHILD'S PLAYTHINGS.

ILL-HEALTH of emotional origin was the subject of last month's talk, and parents were advised that for all children a play area and suitable play equipment must be provided. However small the home, it is important that some space indoors or out or under the home be given over to the children so that they can play happily and undisturbed. By playing alone without the interference of grown ups, the child learns to make his own choices and his own decisions; he learns to concentrate his attention on what he is doing; he learns some of his first lessons in independence. All this is most important to his development. A little child will do the same thing over and over without tiring. Like all of us he needs to practice if he is going to do things well. Give him ample opportunity to practice pushing, climbing, balancing, hammering and singing. Try not to interfere in these activities. If he seems to be doing something awkwardly, do not try to do it for him. Let him learn that success only comes by trying and failing and trying again.

A play pen or a fenced-in part of verandah or yard is a great help to a busy mother with a one to two-year old child. If it is built with a floor which can be covered with a blanket in the cooler weather, baby will escape the draughts that sometimes make play on the room floor uncomfortable. For the pen or play space, toys will be necessary. There are two kinds of toys—those which the child can do something with, and those he can only watch. Make sure that your child has the first kind—he will so soon become tired of the ordinary mechanical toys which he can only watch. Many a child takes more pleasure in a dozen clothes pegs and a few pieces of material to wrap around them than in an elaborate ready-made doll whose clothes will not come off. The little child is interested in making, in building, and in doing. Encourage this because the world today is in great need of do-ers and you do not wish him to develop into the kind of person who is only a looker-on.

Blocks should be part of every child's play equipment. Plain and coloured ones, large ones and small—all blocks are worthwhile toys. They can be used in so many ways—to build houses, trucks and railway trains, and lots of other things too. They can be made at home by father or mother—or better still, both together. Balls are also very satisfactory toys for young children, and large sheets of paper and chalks for drawings; clay or sand or ordinary bread dough, coloured, for modelling all help to keep the children happy and interested through their creative instinct. Toys that can be pushed or pulled by a string such as a truck or wheel-barrow are of special interest to the 2 to 4 year old if they are large enough to be loaded with blocks or sand and unloaded again.

Certain pieces of play apparatus for the back yard such as a sand box and a low swing or a slide help to develop the children's muscles. Toys need not be expensive. Send your "play problems" to the *Sister in Charge, Correspondence Section, Maternal & Child Welfare, Box 634J, G.P.O., Brisbane*, and advice regarding the choice of toys and, if possible, how to make some at home will be sent to you.

Any further information on this or any other matter concerning Maternal and Child Welfare may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane*, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Seasonable Soups.

Haricot Bean Soup.

Soak 4 oz. haricot beans overnight, then place them in a casserole dish with enough stock or water to cover. Cover with a tight-fitting lid and cook until tender. Turn into a saucepan with 1 lb. sliced tomatoes, 2 minced onions, 3 or 4 stalks of chopped celery. Add more stock to more than cover vegetables and simmer until vegetables are tender. Rub through a sieve and keep hot. Melt 1 dessertspoon butter in a saucepan, add 1 dessertspoon flour; cook a little, add puree, and stir until it thickens, then add hot milk to the required thickness. Season with pepper, salt, a little grated nutmeg, and serve with fried croutons.

Mulligatawny Soup.

Place 1½ quarts stock (chicken for preference) in a saucepan with 1 cup chopped apple, 3 tablespoons chopped carrot, 1 cup minced onion, 2 cups water, and, if liked, 1 or 2 cloves and a bay-leaf or a tiny sprig of fresh thyme. Simmer for about 45 minutes, then rub through a sieve. In the meantime melt 2 tablespoons butter or bacon fat in a saucepan, add 2 tablespoons flour, 2 level teaspoons curry powder, cook a little, stirring all the time; then add stock and stir until boiling point. Simmer for another 10 minutes, then add the juice of a small lemon (about ¼ cup). Serve with a little well-boiled rice.

Potato and Cheese Soup.

Take 1½ lb. potatoes, 2 oz. grated cheese, 1 small onion, 1 oz. butter, 1 quart vegetable stock, ½ pint milk, 1 carrot seasoning. Peel the vegetables and cut into small pieces. Fry the onion and carrot for a minute or two in the butter, taking care not to let them colour. Add the potatoes, seasoning, and the stock. Bring to the boil and allow to simmer with a lid on until the vegetables are soft. Whisk up the soup until smooth or put through a wire sieve. Add the milk and, if necessary, some more stock or water. Heat up the soup—do not reboil. Put into a hot tureen or individual cups and sprinkle the grated cheese on top.

Cottage Broth.

Remove fat from 1 lb. scrag end of mutton and cut meat into small dice. Cut the following into dice also: 1 carrot, 2 onions, 1 swede turnip, 2 sticks celery, 1 parsnip, and 1 small potato. Melt 1 tablespoon good dripping in a saucepan, add meat and bones, and fry until brown, add 4 oz. well-washed rice and fry a few minutes longer. Add vegetables, salt and pepper, and 1 teaspoon sugar, and fry for a few more minutes. Add 5 pints stock or water and bring to boil slowly. Simmer for 2½ hours; remove bones and skim off fat, add 2 teaspoons finely-chopped parsley, and serve piping hot.

Mutton Broth.

Cut meat off bones from 1 lb. scrag end of mutton, remove fat and cut meat into dice, then cut up bones. Put them into a large saucepan with 3 quarts water and 4 oz. well-washed barley. Bring to boil and simmer for 1 hour, skimming it well during the cooking. Now add 2 carrots, 2 sticks celery, 2 turnips, cut into dice. Simmer for 1 hour longer, then remove bones. Remove fat, add a little finely-chopped parsley, pepper and salt to taste. Serve piping hot. It is a good idea to cook 3 or 4 mutton shanks in the soup, and these can be served separately with onion, caper or parsley sauce.

QUEENSLAND WEATHER IN FEBRUARY.

Seasonal rains were urgently needed over most of the State at the beginning of February as, apart from the flood totals in the south-east Downs and southern half of the Moreton district at the end of January, rainfall distribution over the greater part of the State had been mostly poor and well below requirements for several months. With the commencement of unsettled weather at the beginning of February good rains were distributed over most of Queensland, reaching heavy flood totals in all coastal districts from the North Coast Herbert south to the border by the middle of the month. At the end of February another flood rain depression was operating over the Port Curtis and Moreton subdivisions. The Peninsula, South and North Coast Barron district rains were slightly under average. A normal average in the Upper West was made up of patchy light to useful amounts, and somewhat similar conditions applied to the Carpentaria. To ensure reasonable wintering conditions, above normal rainfall is required during March and early April in these districts. Average aggregate rains of 3 to 7 inches with heavier local amounts spread over most of the Central and sub-tropical interior. These delayed but opportune falls, the best for years in the South-west drought areas, should do much to revive inland pastoral prospects, especially if additional soaking falls are received during March and April.

The Burdekin River system showed rises in the first few days of the month and, with peak periods about the 6th and 12th, maintained an appreciable run-off until after the 22nd. Flood waters were over the Inkerman Bridge from 5th to 18th, with the highest recording at 14 feet 3 inches over the rails on 12th. This indicates a higher flood than 1944 or 1945, but below the record of 24 feet 10 inches on 4th March, 1946. The Fitzroy River system showed rises on the northern headwaters on 5th, extending generally over the basin with peak flood heights of over 35 feet on 16th at Baralaba and Boolburra (Dawson River) and in the main stream at Riverslea 51 feet 9 inches (17th), and Rockhampton 17 feet 4 inches on 19th. Run-off was still maintained in the last week of the month. The above river heights are the highest for the Fitzroy since 1943. The Mary, Burnett, and upper reaches of the Brisbane River were at reporting levels from 13th to 16th. Such rises in the Burnett River had not occurred since 1942, and the river reached moderate flood heights of 21 feet 9 inches at Gayndah and 15 feet 6 inches at Bundaberg. Local flooding in the Brisbane River system was accompanied by moderate rises reported from Woodford, Murrumba, Gatton, and Rosewood. Mary River peak heights were Gympie 45 feet 6 inches (14th), Miva 43 feet 6 inches (13th), Tiaro 44 feet 4 inches (13th), and Maryborough 16 feet 9 inches (14th), heights at the last three stations being the highest since 1937. A second heavy flood rain spell commenced in the south coastal districts on the 28th, continuing till the 2nd and 3rd March. Carpentaria streams, e.g., the Flinders River, were moderately high from 6th to 12th. The Condamine River system was above normal levels for practically the whole month, and a local peak height at Roma (Bungil Creek) 23 feet (14th) equalled the highest on record. Similarly, south-western streams which rose after the 8th to peaks about 15th/19th maintained a slow run-off, with local rises passing downstream at intervals from further rain towards the end of the month.

Apart from the general main stream rises, there was much local flooding of low-lying areas, especially in coastal districts. Some loss of life was reported, and much damage to property, roads, railbeds, bridges, was caused in many districts, as well as the usual soil erosion from water-logged country.

Temperatures.—An exceptionally cool month, especially as regards maximum readings, mostly 4 deg. to 7 deg. below normal, ranging from 0.9 deg. below at Palmerville to 10.8 deg. below at Longreach, where the highest daily reading of 96 deg. was lower than the monthly mean. Minimum readings ranged from 1.8 deg. above normal at Palmerville to 1.8 deg. below at Thargomindah (Boulia 8 days over 100 deg. and Camooweal 10 days (107 deg. on 15th)).

Brisbane.—Pressure $\frac{9+3}{2}$ 29.955 inches (normal 29.903 inches). Temperatures.—Mean maximum 80.5 deg. (normal 84.4 deg.), second lowest on record (79.8 deg., February, 1893). Mean minimum 68.7 deg. (normal 68.6 deg.). Mean temperature 74.6 deg. (normal 76.6 deg.). Highest daily 85.9 deg. (19th), the lowest daily extreme maximum on record, February. Lowest daily 65.0 deg. (13th). Rainfall.—977 points on 22 days (average 624 on 13 days). Highest daily fall 504 points. Sunshine.—129 hours (normal 205.3), lowest since 124.4 in 1928. Wind gust.—South-east 45 m.p.h. (13th).

The rainfall position is summarised below—

Division.	Normal Mean.	Mean February. 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	1,308	1,800	38 above
Peninsula South	896	815	9 below
Lower Carpentaria	617	680	10 above
Upper Carpentaria	556	756	36 ..
North Coast Barron	1,288	1,202	14 below
North Coast Herbert	1,477	3,199	117 above
Central Coast East	792	2,644	234 ,,
Central Coast West	475	1,845	288 ,,
Central Highlands	351	672	91 ,,
Central Lowlands	310	510	64 ,,
Upper Western	304	313	3 ,,
Lower Western	195	394	102 ,,
South Coast Port Curtis	576	1,455	153 ,,
South Coast, Moreton	658	1,230	87 ,,
Darling Downs, East	304	364	20 ,,
Darling Downs, West	233	604	159 ,,
Maranoa	282	590	109 ,,
Warrego	209	623	199 ,,
Far South-West	165	708	329 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

APRIL.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.57	5.47	Cairns	20	38	Longreach	31	39
6	6.00	5.41	Charleville ..	26	28	Quilpie	36	34
11	6.02	5.36	Cloncurry	44	56	Rockhampton ..	6	14
16	6.05	5.30	Cunnamulla ..	30	28	Roma	16	18
21	6.08	5.25	Dirranbandi ..	20	18	Townsville ..	18	33
26	6.10	5.21	Emerald	15	23	Winton	35	45
30	6.12	5.18	Hughenden ..	29	41	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	p.m.	a.m.
1	3.11	1.00
2	3.55	2.06
3	4.34	3.10
4	5.09	4.13
5	5.42	5.13
6	6.14	6.12
7	6.47	7.10
8	7.22	8.07
9	7.59	9.05
10	8.40	10.01
11	9.25	10.57
12	10.14	11.50
		p.m.
13	11.06	12.40
14	..	1.26
	a.m.	
15	12.01	2.08
16	12.57	2.46
17	1.54	3.22
18	2.51	3.55
19	3.49	4.28
20	4.48	5.01
21	5.49	5.36
22	6.53	6.15
23	7.59	6.58
24	9.08	7.48
25	10.16	8.44
26	11.21	9.47
	p.m.	
27	12.19	10.52
28	1.11	11.58
29	1.56	..
		a.m.
30	2.35	1.03

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	12	28	27	43	2	19	30	52
6	21	18	38	34	12	9	43	38
11	30	10	45	25	20	0	53	28
16	27	13	43	28	18	3	50	31
21	16	23	32	39	8	14	36	45
26	10	30	25	44	0	20	27	53
30	14	25	30	41	5	16	34	48

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS)

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	50	37	63	22	49	9	42
3	20	41	43	58	28	44	17	35
5	30	31	51	53	35	37	25	27
7	40	21	57	44	42	29	33	18
9	48	11	63	38	48	23	40	11
11	54	5	67	34	51	20	44	6
13	53	4	67	33	50	19	44	5
15	48	8	63	36	48	21	40	8
17	43	16	60	41	45	26	36	15
19	34	26	54	47	38	33	29	22
21	23	38	46	56	30	41	20	33
23	13	47	39	62	24	47	12	39
25	6	53	35	66	20	51	6	44
27	6	51	35	64	20	50	6	43
30	18	43	42	59	27	45	16	36

Phases of the Moon.—Full Moon, April 6th, 1.28 a.m., Last Quarter, April 14th, 12.23 a.m. New Moon, April 21st, 2.19 p.m., First Quarter, April 28th, 8.18 a.m.

On April 16th the Sun will rise and set 10 degrees north of true east and true west respectively and on April 5th and 20th the Moon will rise at true east.

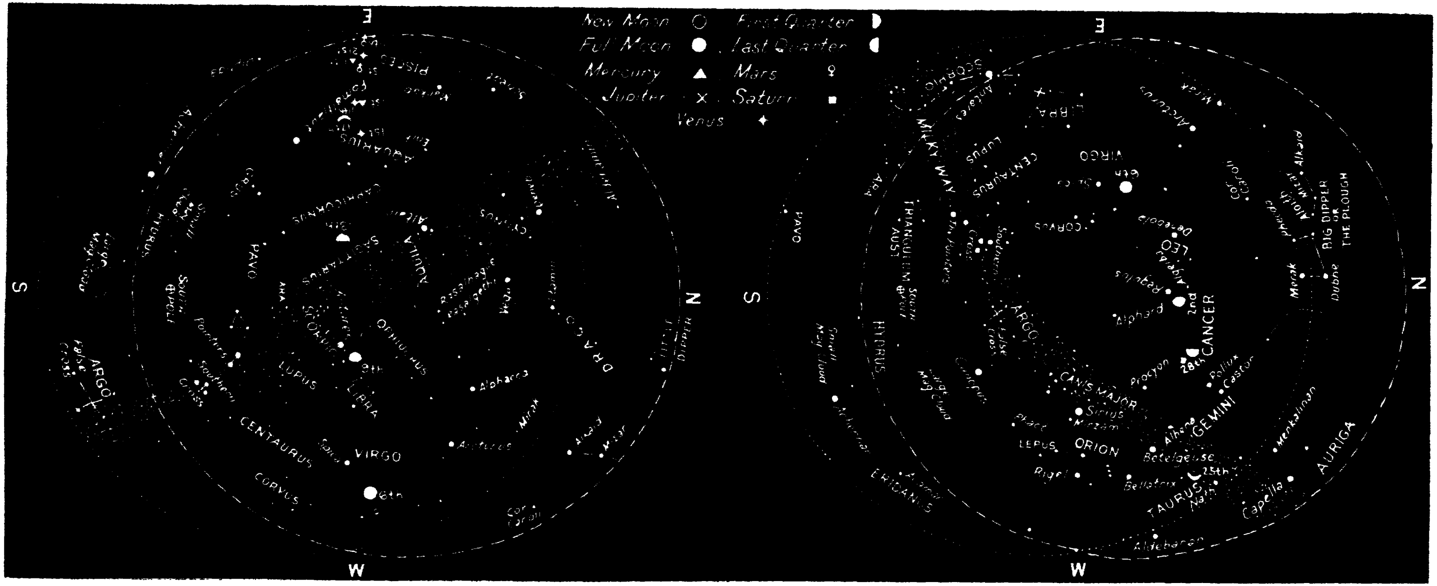
Mercury.—Will be a morning object all this month, reaching greatest angle west of the Sun on April 5th when it will rise a little more than 2 hours before the Sun. It will then be between Venus and Mars: Mars being the faintest of the three and closest to the horizon. At the end of the month Mercury will rise about 1 hour 15 minutes before the Sun and Mars will then be situated between Mercury and Venus.

Venus.—On the 1st, in the Constellation of Aquarius will rise nearly 3 hours before the Sun and will still be a conspicuous object in the Eastern Morning sky. On the 30th, in the constellation of Pisces, it will rise about 2½ hours before the Sun.

Mars.—In the Constellation of Pisces may now be seen low in the east during morning twilight. On the 1st it will rise about 1 hour 25 minutes before the Sun, and on the 30th will rise about 2 hours before sunrise and will then be seen between Mercury and Venus.

Jupiter.—In the Constellation of Libra will be well placed for observation all this month. At the beginning of April will rise between 8 p.m. and 9.15 p.m. and at the end of the month will rise a few minutes before sunset.

Saturn.—Will rise during mid-afternoon at the beginning of this month and about noon at the end of the month. It will set about 1 hour after midnight on the 1st and about 1 hour before midnight on the 30th.



Star Charts.—The chart on the right is for 8.15 p.m. in the South-East corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th April. (For every degree of Longitude we go west, time increases 4 minutes.) The chart on the left is for 8 hours later. On each Chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing North hold N at the bottom; when facing South hold S at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, in the beginning of the month, the stars will be in the positions shown, about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the moon and planets which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

FEBRUARY RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.,	No. of years' records.	Feb., 1946.	Feb., 1947.
North Coast.	In.		In.	In.
Atherton	11·44	42	14·56	12·39
Cairns	16·30	61	20·61	14·29
Cardwell	17·00	71	20·02	52·38
Cooktown	13·71	67	17·57	11·03
Herberton	8·63	57	11·37	7·73
Ingham	17·12	51	18·16	22·52
Innisfail	23·07	62	33·43	32·81
Mossman	20·86	19	22·04	13·44
Townsville	11·33	72	18·75	28·60
Central Coast.				
Ayr	9·62	56	11·99	66·17
Bowen	8·96	72	10·22	87·30
Charters Towers ..	4·63	61	7·45	14·29
Mackay	12·41	72	4·42	31·15
Proserpine	13·85	40	9·71	43·97
St. Lawrence ..	7·67	72	4·49	13·55
South Coast.				
Biggenden	4·18	44	1·40	9·46
Bundaberg	6·39	60	1·30	22·62
Brisbane Bureau ..	6·24	95	7·32	9·77
Caboolture	7·82	67	5·89	15·44
Childers	6·42	48	2·25	21·33
Crohamhurst.. ..	12·48	50	8·19	27·30
Esk	5·24	56	4·80	6·43
South Coast—contd.	In.		In.	In.
Gatton College ..	3·52	44	6·34	..
Gayndah	4·20	72	1·30	8·22
Gympie	6·58	73	4·73	15·02
Kilkivan	4·91	62	6·20	11·61
Maryborough ..	6·65	72	2·24	13·96
Nambour	9·57	47	8·36	25·39
Nanango	3·93	61	3·28	5·82
Rockhampton ..	7·74	72	2·87	11·05
Woodford	8·05	55	5·95	17·64
Darling Downs.				
Dalby..	2·85	73	2·42	2·69
Emu Vale	2·59	47	1·87	1·80
Jimbour	2·75	64	3·00	2·35
Miles	2·72	58	2·03	3·06
Stanthorpe	3·18	70	1·41	3·65
Toowoomba	4·53	71	5·54	9·32
Warwick	3·10	78	2·75	2·45
Maranoa.				
Roma	2·87	69	0·20	6·46
St. George	2·39	62	0·84	5·49
Central Highlands.				
Clermont	4·27	72	3·30	4·45
Springsure	3·78	74	1·54	6·38

CLIMATOLOGICAL DATA FOR FEBRUARY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	89	74	94	2, 15	70	5	1,429	19
Herberton	..	82	66	90	1, 2	60	20	773	17
Townsville	..	87	74	95	14, 15, 14	68	1	2,860	17
Rockhampton	29·86	84	71	92		68	24	1,105	18
Brisbane	29·98	81	69	86	19	65	13	977	22
Darling Downs.									
Dalby	..	83	65	92	19	59	17	279	7
Stanthorpe	..	75	59	86	19	50	17	365	18
Toowoomba	..	74	61	89	19	53	17	932	18
Mid-Interior.									
Georgetown	29·78	90	73	95	15, 20	68	21	530	8
Longreach	29·82	86	71	96	1	57	2	622	12
Mitchell	29·85	84	70	93	7, 8	64	25, 26	731	12
Western.									
Burketown	..	92	76	97	14, 16, 24	70	27	1,205	15
Boulia	29·73	94	74	105	1	68	11, 27, 28	362	10
Thargomindah	29·81	88	72	101	9	60	10	638	12

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,

Meteorological Bureau, Brisbane.

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Edited by
J. F. F. REID
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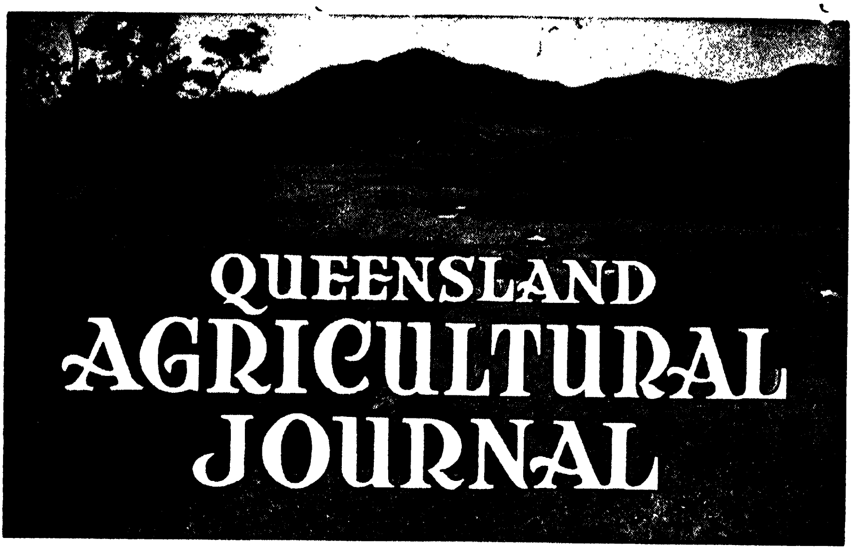
ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



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Event and Comment.

Soil Conservation.

AS already announced by the Minister, Hon. H. H. Collins, a comprehensive programme of investigation and demonstration to ascertain the best methods of conserving soil has been entered upon by the Department of Agriculture and Stock. As part of the investigational section of this programme, work has commenced at the Hermitage Regional Experiment Station in the Swan Valley on the Eastern Darling Downs. Ascertaining suitable cropping rotations for use on various types of slopes to conserve soil and to indicate the need of terraces, and the best types and methods of constructing them, are part of the general plan.

For terrace formation, various types of equipment have been purchased and it is intended to supplement this machinery with a series of installations which will enable soil losses and run-off of storm rains to be accurately measured under a range of cropping rotations. Similar work is also planned for the Kairi Regional Experiment Station on the Atherton Tableland. It is anticipated that the data obtained from these field investigations will form the basis for the laying down of a sound system of soil conservation which will involve correct land use practices and improvement of soil fertility and productivity. Plans for extending similar activities to selected demonstration areas in other places on the

Darling Downs are well in hand. Elsewhere, notably in the South Burnett, a considerable number of demonstration areas have already been established.

Mr. Collins has also announced the establishment of a new position within the Department of Agriculture and Stock, that of Soil Conservationist, to which an experienced and fully-qualified officer has been appointed.

Market Price Reporting Service.

Another new development in the Department of Agriculture and Stock has been announced by the Minister, Hon. H. H. Collins, and that is the inauguration of the Market Price Reporting Service within the Division of Marketing, which is designed to provide primary producers and others interested with authentic daily reports of market movements and values. An officer who has had many years of experience of price reporting in the Sydney markets is in charge of this additional service to all engaged in the land industries. As a commencement, daily price reports are prepared and disseminated to fruit and vegetable growers; this benefit will be extended to other primary producers as trained staff and facilities become available.

Tobacco Irrigation.

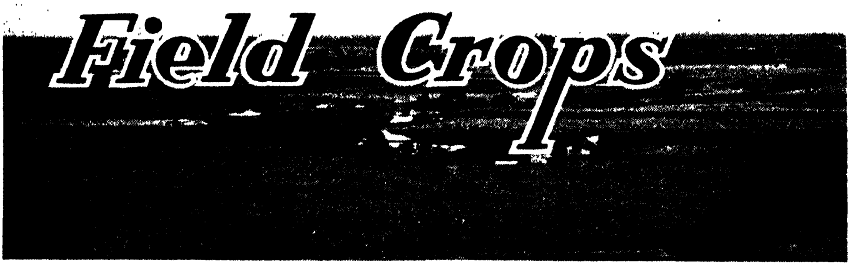
Outlining a water conservation scheme for irrigating tobacco lands at Dimbulah and Mareeba, the Minister for Public Lands, Hon. A. Jones, has announced that early developments in the project would include a weir on the Walsh River 3 miles upstream from Dimbulah; and a weir on Granite Creek, a tributary of the Barron River, 4 miles above Mareeba.

Experience had shown that stability of the tobacco industry depended on the availability of water, said Mr. Jones. The Walsh River project provided for a series of weirs, and the one near Dimbulah would back up the water for at least 2½ miles and impound 800 acre feet or 220,000,000 gallons. The most important part of this scheme, however, would be a storage dam 21 miles above the new weir, which would have a height of at least 60 feet and form a lake 5 miles long and 5 miles broad.

A series of smaller weirs was planned for the tributaries of the Barron River, added Mr. Jones. One weir had already been built on Emerald Creek, and others would be constructed on other tributaries in Granite, Atherton, Rocky and Tinaroo Creeks.

Last month the first sod of the Walsh River weir was turned by the Minister for Public Works, Hon. H. A. Bruce; a similar function at the Granite Creek site was performed by the Minister for Agriculture and Stock, Hon. H. H. Collins.

Mr. Jones also stated that work would begin on the big border streams project as soon as men and materials were available. The water stored would supply 70,000 acres of irrigable land along the Macintyre and Dumaresq Rivers. The scheme would involve a big barrage at Mingoola, with twelve weirs and five regulators down-stream.



Soil Management.*

W. J. S. SLOAN.

Introduction.

DURING recent years the problems of soil erosion and loss of soil fertility have received increased attention, and publicity has been given to criticism of modern methods of cultivation and the extensive use of artificial fertilizers. In general, would-be agricultural reformers claim that the salvation of agriculture lies in the adoption of "back to nature" methods, the abandonment of inorganic fertilizers, and a revision of methods of soil preparation and crop cultivation. There is no monoculture in nature, that is, the growing of single crops in pure culture; mixed culture is the rule. Cultivation tends to destroy the fertility reserve in the soil which under natural conditions is built up in the form of humus in the upper layers of the soil by the activities of micro-organisms, earthworms, and the like, from the residues of plant and animal life. Therefore, critics assert that stable agriculture and successful food production can only be secured by imitating as closely as possible the processes which operate in nature. However, the improvement and maintenance of the soil humus content is not an easy problem and this paper is presented for the purpose of briefly examining methods advocated as substitutes for present-day practices by several writers.

Maintenance of Soil Humus in Cultivated Land.

Howard (2) believes that the ideal method is to make humus in specially prepared compost heaps from plant residues and the dung and urine of farm animals and then return it to the fields. Ploughing, thorough drainage and sub-soiling, he says, are all essential for aeration of the soil, but he condemns the continued expansion of the machine in agriculture because manure from animals is necessary for correct humus production. Apart from improvement in the soil structure and the addition of plant nutrients, the benefits of specially prepared humus are claimed to include the creation of a favourable soil environment for the development of mycorrhizas on the roots of crop plants. This fungal root association is suggested as the basis of healthy plant growth and resistance to pests and disease. Howard (3) and Sykes (7) claim further that the health of stock is improved when they are grazed and fed on crops produced by the use of humus. Moreover, Howard believes that the health of the populace generally would be raised if a keener appreciation of the use of properly prepared humus could be developed

* Paper presented at the Bundaberg Conference, Q.S.S.C.T., April, 1946, and reprinted from *The Cane Growers' Quarterly Bulletin* (Bur. Sug. Expt. Stns., Dept. Agris. & Stk., Q.), Jan., 1947.

in farming communities. Biodynamic farmers (6) are in agreement with the greater part of Howard's thesis, with even greater emphasis on the need for mixed farming, and the use of farm animal manures in humus production. The basis of their argument is that the soil must be fed, not the plant. A fertile soil is rich in organic matter and is alive by virtue of the fact that it contains enormous populations of micro-organisms. If the latter are fed with properly prepared humus, healthy plant growth and high quality produce are a natural sequence. Biodynamic farmers hold extremist views with regard to humus preparation, and believe that manure and compost heaps should be treated with certain mysterious starters prepared by fermenting at specific depths in the soil special herbs and plants in close contact with certain parts of animals. Emphasis is laid particularly on the value of humus prepared from animal manure and urine in the belief that such humus contains special growth-promoting substances.

A variation has been introduced by Faulkner (1) in a popular, but unscientific, book which has received considerable publicity. Humus production and the imitation of nature's methods are the main theme, but the use of the mouldboard plough is violently opposed because the complete burial of organic matter is in sharp contrast to the rotting down of organic matter on the soil surface which takes place under natural conditions. Soil preparation and crop cultivation therefore should be limited to the top few inches of the soil. Faulkner believes that the drainage problem is accentuated by the deep burial of organic matter, because rain water would be absorbed by the soil and not accumulate in hollows if the soil surface was maintained in an open granular condition by the incorporation of plant wastes in the top few inches only. Unlike the writers previously mentioned, he does not define any method for preparing humus under special conditions off the field, the emphasis being laid on sheet composting in the field itself by chopping up green manure crops and plant residues with disc harrows or similar implements in a manner comparable to the operation known as stubble mulching.

Although it has received greater prominence in recent years, the value of soil humus has long been recognized. No modern agriculturist of repute has failed to appreciate the merits of organic matter in soil conservation and crop production and to advocate consistently the maintenance and improvement of the humus content of cultivated soil. However, the artificiality of agriculture is a problem which cannot be overcome. While the need for rotations is recognized, there is no alternative to monoculture over large areas of arable land. Under natural conditions the law is survival of the fittest, but under cultivation the aim is to prevent the growth of all plants other than the main crop. Sowing fields with mixed cultures of crop plants would create chaotic conditions in cultivation and harvesting. Clearing and fencing land, row cropping, the development of new strains of crop plants, and so on, are obviously unnatural, but very necessary to maintain the volume of primary production.

The need for maintaining humus at an adequate level in cultivated soil is undeniable, but methods must be both practical and economic. Preparation of compost heaps under special conditions would require a considerable expense in labour and add to costs of production. Moreover, the machine has come to stay in agriculture and the number of farm animals will steadily decline in the future on farms mainly devoted to the cultivation of a single crop. The claim that well prepared humus

confers on the soil special properties of significance to growth of crops, apart from its mineral nutrient content and the beneficial effect on soil structure, has not been satisfactorily proved. There is strong evidence that mycorrhizas are associated with vigorous growth of certain forest trees, but Laycock (4) investigating the effects of endotrophic mycorrhizas on cacao found that they tended to be more prolfic on unthrifty trees, indicating that they were not of importance in the nutrition of the cacao tree. Prepared plant hormones are used for improving the rooting of cuttings, but there is no evidence that vitamins or other specific growth-promoting substances which may be present in organic manures increase crop yields or have any special nutrient effect.

The intelligent application of green manuring, trash conservation, and grassland rotation where possible, offer the best solution to the cane farmer in maintaining and improving the soil humus content. Green manuring, although it does not add greatly to the humus content, does supply valuable nitrogen and in addition protects the soil from unfavourable weather conditions and arrests the loss of humus. Crop residues provide the best source from which the cane farmer can make an appreciable addition to soil organic matter. Trash conservation is probably of more importance on some soils than others.

Unfortunately, the war years have brought about an increase in the burning of cane before harvesting and large quantities of organic matter which might otherwise have been utilized for soil improvement have been lost. However, the cane roots and the trash which survives burning, particularly from well fertilized crops, do add an appreciable amount of organic matter when ploughed in. Molasses and mud or press cake are other excellent sources of organic matter where they are available to farmers. The grassing of idle land for a few years is undoubtedly one of the most important methods of raising the organic matter status of the soil. The grass roots also promote a desirable crumb structure favouring the formation of good tilth and, moreover, the grassland rotation assists to lower the weed population.

The Role of Inorganic Fertilizers.

Antagonism to the use of so-called "artificial inorganic fertilizers" is unscientific and not based on sound experimental data. Fertilizers like potash, guano, lime and sodium nitrate, are derived from natural deposits and are no more artificial than the mineral particles of the soil. Inorganic fertilizers in general are not harmful to the physical and chemical condition of the soil if applied intelligently. It is true that the continued use of sulphate of ammonia may increase soil acidity, but this is readily checked by periodic applications of lime. Sodium nitrate may also have an adverse effect on heavy soils, but this can be avoided by using other nitrogenous fertilizers for this type of soil. Indiscriminate use of fertilizers without correct soil management to maintain good physical condition may give disappointing results, but on the other hand additions of organic matter low in plant nutrients may be equally unsatisfactory unless supplemented with inorganic fertilizers. The population of micro-organisms is higher in soils treated with organic manures, but the normal rates of application of inorganic fertilizers have not been proved to be harmful to these organisms. Nor has it been shown that the resistance of plants to pests and diseases and the quality of produce are lowered by the use of balanced inorganic fertilizers.

There is no doubt that organic matter is of great value in arresting soil erosion, but there is no evidence that the correct use of balanced fertilizers has directly caused it on a large scale. In the case of some unskilled farmers, artificial fertilizers may have been a contributory cause insofar as they influenced neglect of soil management. However, inorganic fertilizers have been very useful on eroded soils in helping the establishment of soil stabilizing plants and thus preventing further erosion. Their use in cane produces larger crops and makes available a greater quantity of trash and roots for incorporation in the soil. However, there is no question that inorganic fertilizers must be used intelligently, otherwise results may be disappointing. Balanced fertilizing is required and there is definitely a limit to rate of application, above which gains are not economic. Consistent success is only achieved when fertilizing is combined with soil management to maintain a good structural condition of the soil.

Soil Preparation in Relation to Crop Residue Management.

Criticism of modern agricultural methods is essentially based on the question whether land should be cultivated deeply and the organic matter turned under, or whether soil preparation should be limited to chopping up weeds and crop residues in the top two or three inches of the soil without any disturbance of the lower layers. Burial of the greater portion of the organic matter in land preparation is necessary to provide a good seed bed, help weed control, enable efficient planting, cultivation, irrigation, and harvesting in rows with machines, and to facilitate the decomposition of organic matter to humus. Moreover, deep ploughing to leave a lumpy surface promotes penetration of rain and thus reduces erosion. If organic matter fails to rot down before planting, the growing crop will often exhibit nitrogen starvation which, unless corrected, may adversely affect yields. This possibility is increased where the organic matter is merely incorporated in a shallow layer of surface soil. The elimination of ploughing would cheapen seed bed preparation but cultivation costs would be higher. Practice has shown that inadequate preparation aggravates the weed problem. Nutgrass, couch, and summer grasses are more difficult to control unless the land is well cultivated, particularly if rain should occur at or just after ploughing. Rotary tillage is claimed by some as the solution to the problem of eliminating the need for ploughing, but it is doubtful if consistently good results can be obtained by this means alone. Alternation with deeper ploughing or grubbing or subsoiling would be required periodically to break up the hard pan which continued use of rotary tillers will produce in cultivated land. A recent paper by Matthews (5) gives interesting information on the value of various ways of incorporating crop residues in the soil for dry land crop production. This constitutes a summary of results obtained over a number of years in experiments at field stations in the Great Plains and Columbia River basin of U.S.A. Small grain crops, chiefly wheat, were grown and the soil treatments included leaving all the residues on the surface, leaving a portion of the residues on the surface, and completely burying the residues. Yields were much the same for all soil treatments. The conclusion was that the need for leaving crop residues on the surface was largely dependent on a long-term view of erosion rather than the expectation of materially influencing current yields.

Conclusion.

Dogmatic opinions in agriculture are unwise and usually not in the best interests of the farmers and the community generally. Experience has taught that most soils and farms need their own individual treatment. Given certain well-founded principles, the farmer's own knowledge must supply the details for the management of his land to the best advantage. Nevertheless, the views discussed above, while lacking evidence from sound experimental work to support their extravagant claims, do contain a useful warning to farmers. It is a matter of everyday observation that where trash is left on the surface rainfall absorption by the soil is better, run-off is thereby reduced, and the rate of erosion slowed down. Uncovered, bare soils are liable to serious deterioration in tropical and sub-tropical areas of high rainfall. It is true that some farmers powder the soil unnecessarily by over-cultivation, and some tend to rely too much on inorganic fertilizers without due regard for the structural condition of the soil. The commonsense view is to combine the use of inorganic fertilizers, properly balanced for the soil under consideration, with soil conservation by the use of green manuring and the return of organic matter to the soil. Fortunately, the cane farmer is using a crop which has many advantages. There is a prolific growth of roots, the soil is protected by a leafy canopy during the period of high temperatures and heavy rains, and run-off and erosion are checked by the fibrous roots and stools.

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THE KEEPING OF FARM ACCOUNTS.

In the business of farming, as in any other commercial enterprise, the keeping of accounts is a necessity.

An accurate system of bookkeeping, besides showing the results of trading operations, will enable a farmer to see his exact financial position and to say definitely what he is worth at a particular date; what he owes; what is owing to him; and whether he is gaining or losing.

To meet the need of a simple system of keeping farm accounts, the Department of Agriculture and Stock has published a handy brochure on farm bookkeeping. A copy may be had free of charge on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Some New Agricultural Implements.

Subjoined is an extract from a comprehensive report by Mr. E. R. Behne, Assistant Director and Chief Mill Technologist of the Bureau of Sugar Experiment Stations, on his mission to the United States, Cuba and Hawaii to study recent developments in mechanized agriculture, and which was published in extenso in the Cane Growers' Quarterly Bulletin (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1946.

IN contrast to common practice in Queensland, growers in Louisiana hill the land into 18-inch ridges six feet apart, and then plant the cane at an average depth of six inches at the top of these ridges. In Hawaii the reverse is the case in the irrigated areas, viz., the cane is grown along the bottom of deep irrigation trenches. The latter practice is followed in irrigated districts of Queensland, but these of course represent only a small part of the Queensland cane areas. Naturally different methods of cultivation in many cases call for special implements, many of which are unlikely to have immediate application under Queensland conditions. Moreover, under the plantation system in Hawaii large heavy units are generally used and these, in any case, would be impracticable for the average Queensland grower.

When at Chicago the delegation visited the International Harvester Company. Here discussions around farming equipment were had and films illustrating new equipment were seen. In past years this Company maintained an implement showroom,, but during the war years, from lack of space, this had to be discontinued. Consequently, it was not possible to see a selection of implements for cane cultivation. A visit was paid to the tractor factory of this Company.

There were, however, in general use several implements which it is felt might be of interest to Queensland cane farmers.

Implement for Ploughing out Stools.

This implement (Plate 68) is used extensively in Louisiana, and was referred to by Mr. N. J. King in his report to the Queensland Society of Sugar Cane Technologists, 1939. It consists of a heavy rectangular frame with a straight coulter at the front. Behind this is a double mouldboard plough or middle buster—the implement itself is frequently referred to as a middle buster. At the rear are two gangs of scalloped discs, one on each side of the middle buster. As this implement is drawn along a row of stubble behind a tractor, the straight coulter splits the stool, which is then rooted out by the middle buster, half to each side, into the paths of the two gangs of scalloped discs.

The operation of this implement was later discussed with the executives of the International Harvester Company in Chicago, who agreed to the suggestion that such an implement be brought to Queensland for trial purposes. Some modifications may be necessary for Queensland conditions, when the ratoon fields are reasonably level before plough-out, since the middle buster would then leave a furrow along the line of the cane row.

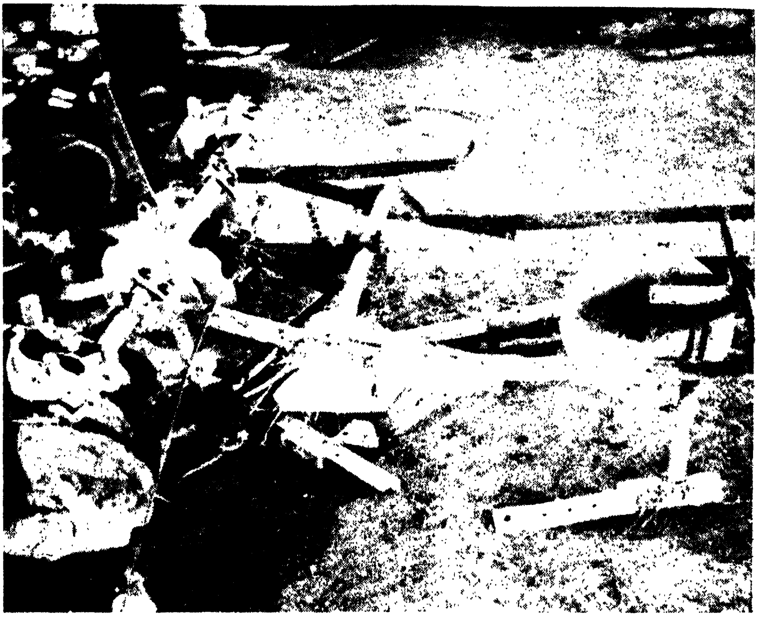


Plate 68.
IMPLEMENT USED IN LOUISIANA FOR PLOUGHING OUT STOOLS.

Manure Spreader.

At Albania Delgado, in Louisiana, a new International Harvester Manure Spreader was inspected and later, in Chicago, a film showing the machine in operation was seen at the headquarters of the Harvester Company.

The implement consists of a two-wheeled pneumatically shod cart drawn by a tractor. Operated by chains from the axle of the cart is a conveyor delivering towards the rear of the cart, where a scroll-type spinner is mounted. The cart is loaded with farmyard manure and then taken to the field. Here, by moving a lever, the chain drive is connected to the sprocket on the axle so that when the cart is moved forward the conveyor operates and carries the manure to the distributor, which is said to fling it a distance of 18 feet to either side. Such a machine might find application in handling filter cake and for spreading lime.

Disc Weeder.

This implement, which is a tractor attachment, was seen in Hawaii, where, it is gathered, it was developed from the Churchill irrigation-furrow reshaper. It is now referred to as the Ford Disc Weeder. It consists of two toothed discs drawn behind a tractor. The axes of the discs are in the same vertical plane, but are inclined towards each other at the top. This angle is adjustable so that the slope of the discs may be varied to suit the sides of the furrows down which they are drawn. The discs rotate by friction on the ground and the teeth acting in the manner of a cultivator remove the weeds. A typical construction is as follows:—

The discs, which are 36 inches in diameter, are made of ½-inch plate and are dished about 1½ inches. A ½-inch by 1-inch circular reinforcing

plate is welded in the centre of the disc and to this plate is welded a piece of 2½-inch heavy pipe 18 inches long. This pipe serves as a standard, and, by passing it through a bushing on the tool bar bracket, it also acts as a journal for the disc. Adjustable collars are placed above and below the bushing so that the discs may be regulated for height.

The cutting rim on the disc is made from ¼-inch by 4-inch spring steel. Some rims are notched, some are used plain, and some have a row of 3-inch long harrow teeth around the edge at about 3-inch intervals. The type of disc used depends on the amount of—and type of—grass that is to be removed.

In another type seen at the Oahu Plantation the solid disc is replaced by a six-armed spider (Plate 69).

One man driving the tractor is reported to be able to cultivate from 4·5 to 6 acres per day.

FLAME AND SPRAY CULTIVATION.

The elimination of weeds from canefields is one of the chief problems confronting the farmer and has been so ever since the crop was systematically cultivated. Hand chipping or hoeing was for long the only method and, as long as cheap labour was available, was eminently satisfactory. Mechanical methods have now been introduced, but these do not completely control weeds in or near the cane row, and few farmers are able to carry on without occasional chipping. Moreover, recent investigations have indicated that repeated mechanical disturbance of the soil causes a breakdown in soil structure, depletes fertility, and damages the root system of the cane.

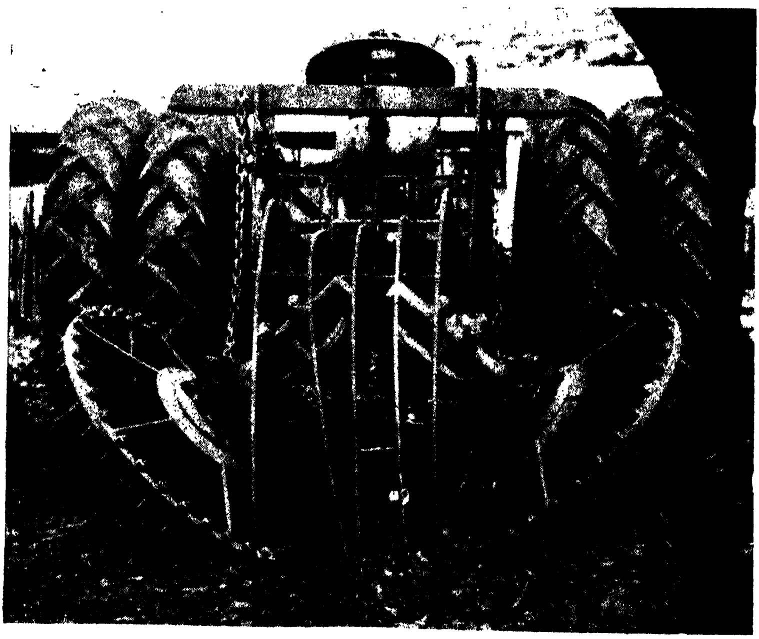


Plate 69.
DISC WEEDER USED IN HAWAII.

In those countries where labour costs are high, it is natural that efforts have not been spared to develop other methods of weed control and the two most promising so far are: (1) the use of flame to burn the weeds, and (2) the use of weedicides to kill the weeds. The former has been used on quite a large scale in U.S.A., particularly in the cotton areas, whilst its application to sugar fields is said to be spreading rapidly. The poisoning method has been used in the cane areas of Hawaii for many years, whilst at present a new type (or rather a modification of an old type of poison) is being tested extensively.

Plate 70.

SULKY TYPE OF FLAME WEEDER USED IN LOUISIANA.

Flame Cultivation.

This is also described as selective burning, since the procedure is to apply a hot flame along the entire row of plants when the weeds are small and to rely on the greater resistance of the cane (in the case of canefields) to the scorching effect.

Several types of apparatus and fuel are used and a number of reports have been prepared by Dr. Barr, of the Louisiana State University, on their operation.

The flame cultivator is used to destroy young weeds in the row of cane from the time the cane is 9 inches above the ground until it is 3 to 4 feet high. In the case of Johnson grass (*Sorghum halepense*)

results have been variable—some tests having been successful and others doubtful. It is believed, however, that improvements in technique may result in effective control of this grass.

There are two main types of cultivator in use: (*a*) the sulky type (Plate 70) and (*b*) the tractor type. The same principles are employed in both, but in the latter type the entire equipment is mounted on the tractor and operated from the power take-off. The sulky type is the more common and consists of a two-wheeled vehicle carrying a reservoir of fuel, compressor and burners. For keeping the burners correctly placed over the row a skid arrangement is provided. Two burners operating on the Bunsen principle are provided and are attached near the ground facing each other. They are mounted flexibly and adjusted so that the flames do not meet, since this would cause considerable upscorch.

The machine is of very simple construction and similar ones could be built in Queensland at a very low cost.

At a later date the delegation visited the Fijelan Research and Development Co., Washington, D.C., which Company holds the U.S. patent rights for the "Sizz Weeder." The managing director of this Company stated that 500 machines were operating in the United States, of which 200 were in the sugar cane areas of Louisiana, the remainder being mostly in cotton.

The acreage handled naturally varies with the kind, thickness, and growth of the weeds to be treated. A single-row machine would handle from 40 to 100 acres per week; the usual practice is to cover each field once per week. This principle is also used to some extent in Louisiana for keeping permanent railway lines free of weeds. In this case the burners are mounted on a small truck drawn behind a locomotive.

Spray Cultivation.

The killing of weeds by poisons is not a new idea. For many years arsenical sprays have been used, but these have certain drawbacks, although it may be mentioned that opinions regarding these are somewhat controversial. It is claimed in some quarters that the constant application of arsenic to the soil results eventually in an accumulation of this element which may be detrimental to root development, and so reduce production, particularly in light textured soils. Others point out that the concentration of arsenic to produce this effect in the soil is never likely to be reached with the rates of application normally employed. The hazards of handling this material have also received their share of over- and under-statement. Admittedly the use of arsenic is not to be preferred if some other "non-poisonous" but equally efficacious weedicide can be developed.

To this end the Experiment Station of the Hawaiian Sugar Planters' Association has been experimenting with diesel oil emulsions, since diesel oil is a well-known weedicide. Numerous mixtures have been made and tested and at present what is known as "Cade 24" has proved the most promising. This is a mixture of diesel oil, water, an activator and a spreader or wetting agent. A concentrated emulsion is first prepared using diesel oil and water in the proportion of two to one. Incorporated in this concentrate are the wetting agent and part of the activator. If all the activator were added here it would break the

emulsion. Magnesium in the water has the same detrimental effect so that magnesium-free water is essential. Fairly high concentrations of sodium chloride may be tolerated.

This emulsion must be absolutely stable so that special care must be given to its preparation. Any of the standard types of equipment may be used for this purpose, but that selected by the Experiment Station of the H.S.P.A. is a high pressure pump which circulates the oil and water mixture through a small orifice under very high pressure (2,500 lb. per sq. inch). A high speed agitator or disc colloid mill may also be used, but all are expensive pieces of equipment and capacities are low.

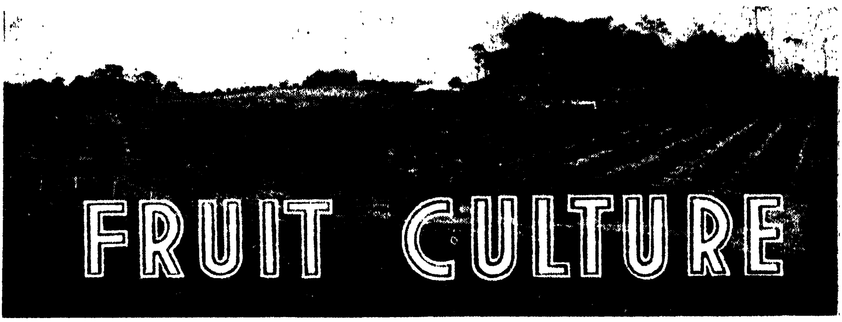
Before application, this concentrate ("Cade") is diluted with water containing the remainder of the activator, the degree of dilution varying from 1 to 10 to 1 to 40, depending on the size of the weeds to be treated. The diluted mixture is then sprayed on to the weeds by any of the usual types of spray. It was stated that for weeds one inch high the higher dilution was satisfactory, and about 175 gallons per acre in each of two applications was sufficient to give a complete kill.

With a tractor drawn tank with pump and hose attachments and operated by three men, three acres per day may be sprayed.

No cost data were available, but a request for complete information was made to the Director of the Experiment Station, since this development may prove of considerable value to certain areas of Queensland, e.g., the heavy rainfall areas, and the irrigated areas, where it is undesirable to interfere with the expensive irrigation set ups by cultivation. Naturally it will be necessary for well conducted trials to be performed here before the value of this weedicide may be generally assessed.

It is interesting to report that tests have been started to determine whether this weedicide may be effective in killing cane before the pre-harvest burn in order to improve the effectiveness of the burn. No results have yet been obtained but it was stated that from the appearance of the trash on treated cane some improvement was anticipated.

Plate 71.
THE BEACH NEAR PORT DOUGLAS, MOSSMAN DISTRICT, NORTH QUEENSLAND.



Citrus Pruning.

R. L. PREST, Horticulture Branch.

WHILST citrus trees do not, in most instances, require drastic pruning, nevertheless a certain amount is essential in all varieties and with some, particularly mandarins and lemons, correct thinning can mean the difference between a very good crop and a very poor one.

The following is an outline of the essential points to be observed with the main varieties.

ORANGES.

Young Trees.—The pruning of young trees should be confined to the removal of adventitious shoots from the stem and the checking of excessively vigorous growths from the main arms. Two secondary arms may be permitted to grow from the ends of each of these main arms so as to develop a strong and well-shaped top. Other secondary arms will grow but should be removed. Undesirable shoots which grow all along the main arms, and which are obviously out of place and would by their continued growth weaken the framework of the tree, should be cut away. In instances where awkwardly-shaped trees are received from the nursery, it is often possible to train a shoot, which ordinarily would be out of place, to develop and fill up a gap. Such training involves shortening back the required shoot at some dormant period of growth to a bud pointing in the direction it is desired the shoot should grow. Long, weak limbs that do not show a tendency to branch should be headed back generally to the limit of other growths, so that the tree will grow strong, compact and symmetrical. The top should not be allowed to become too dense; on the other hand, it should not be kept so open as to permit scalding of the main limbs and branches by the sun.

Bearing Trees.—Provided that a well-developed framework has been maintained, young, well-grown trees should come into profitable bearing at between four and six years. During the first years of bearing, pruning should be directed towards the removal of sucker growths from the main branches and of weak fruiting shoots. Where pruning operations have been diligently carried out on young trees, they actually require very little pruning during the first fruiting years, except that they should be gone over occasionally and suckers removed. Sucker growths may, as a general rule, be considered parasitic, but they do not necessarily remain so, for in many instances they later produce bloom and fruit of normal fullness. This fact can be made use of when necessary in replacing broken and damaged limbs.

There is no doubt that the low production in the case of many older but well-cared for orchards is due to the lack of vigorous, healthy fruiting wood. This condition points to the necessity for a periodical renewal of fruiting wood, which can best be accomplished by thinning out and at the same time shortening back terminal growths and twigs. The cuts should be made right back to strong new growths, removing weak shoots and those that have borne fruit. The thinning leaves room for the necessary subdivision, whilst the shortening back tends to force into growth dormant buds from behind, stops the excessive growth of any branches, and at the same time renews supplies of fruiting wood. Where crowding of growth becomes evident, the removal of an entire branch is at times desirable. The entry of plenty of light and air assists the growth of healthy and vigorous shoots behind the outer ring of foliage. These new shoots make new fruiting wood; at the same time any excessive growth of suckers or water shoots which arise from well inside the tree following heavy pruning require to be cut away or they will absorb a lot of vigour and crowd the centre.

Old Trees.—In older trees, where growth has become stagnant, provision will be required to be made for the removal of old-crowded and dead limbs. In such instances, pruning is of a much heavier nature, requiring at times the removal of large branches. Such branches should be cut right back to their source of origin so that the sap is readily diverted to the remaining limbs, encouraging the growth of new wood. Under no circumstances should stubbing be resorted to. In instances where it is necessary to replace a number of large limbs, it is preferable to do the work gradually over two or more years to avoid excessive suckering.

The lower branches of trees should not be allowed to touch the ground, as fruit borne on such branches is generally blemished and of poor quality. On the other hand, trees should not be pruned too high from the ground. The height to which they should be lifted varies according to circumstances; in most instances, knee-high will prove to be satisfactory.

In Queensland the regular thinning and pruning of bearing trees is definitely necessary and should be carried out during the winter months, and, where possible, completed before spring growths occur—particularly where regular pruning has been neglected and heavy cutting is necessary. Frequent and regular treatment tends to preserve as nearly as possible the balance between the root system and aerial portions of the tree, assists in economical pest control and cultural requirements, and counteracts adverse climatic conditions.

MANDARINS.

The majority of mandarins, when not systematically trained and pruned, are often merely shrubs—not trees. They naturally grow very densely, and unless regularly thinned out and shortened back after the fruit has been harvested, the massed twigs become so dense that many perish and the remainder are so weakened that only small inferior fruit are produced.

The treatment at planting is identical with that of the orange. After the first season from planting, numerous vigorous upright shoots arise from the head of the tree. While small, these should be thinned, leaving only those which will assist in building a desirable framework.

These should be carefully watched, and where the growth becomes too lengthy they should be shortened back to the limits of other growths. Heading back and thinning may be done when growths have hardened, not when they are soft and growing rapidly. It is possible to check excessive growths by pinching out an inch or so of the tips.

The densely growing habit of the mandarin, particularly such varieties as the Beauty of Glen Retreat, Scarlet, Thorny, and similar types, leading to a profusion of weak shoots, is responsible for over-bearing and resultant small and inferior fruits at an early age. Providing that a well-developed framework has been maintained, young, well-grown mandarin trees may be permitted to bear at four years of age. The annual pruning of bearing mandarin trees requires the same regular and close attention as in training and forming young trees. The dense growths and crowded branches require to be well thinned out and shortened back to vigorous laterals of current season growth; weak twigs and, where possible, shoots that have borne fruits, should be removed. In the case of types similar to the Beauty of Glen Retreat, Thorny and Scarlet, the thinning and shortening back may be described as heavy; modifications should be practised according to the habits of the tree growth of the various types of mandarins. Types such as Fewtrells Early and Ellendale Beauty resemble the orange tree in growth and should be treated accordingly.

The annual pruning, permitting ample light and the ready circulation of air throughout—

(1) Greatly increases the vigour of the tree;

(2) Removes surplus growths and twigs;

(3) Improves the size and quality of the fruit; and

(4) Provides for the renewal of ample, young, and vigorous fruiting wood.

LEMONS.

With lemons, the general practice with growers has been to prune severely while the trees are young in an effort to control the growth and so produce a strong framework. In some instances, such treatment has retarded growth, and certainly it has retarded the early fruiting of the trees. Apart from the necessary trimming at planting, which, similarly to oranges, consists of shortening back and removing broken and bruised roots, and a corresponding shortening back of the head of the tree in such a manner as to produce a strong, straight stem with three or four well-placed arms radiating therefrom, little pruning should be done during the first two or three years. All that is necessary is a light thinning to remove any undesirable shoots that are out of place and would later upset the balance of the tree, and, perhaps, a shortening of excessively vigorous shoots. Main, upright growing limbs, evenly spaced, should be selected as main leaders. As the tree grows older these limbs become weighed down at the ends by further branching and the weight of fruit; strong side shoots will develop from them. These side shoots should be thinned out, but not all removed. Those left, when hardened, should be shortened back to three or four buds to form spurs, which will produce the best fruit. Suitably placed growths may be left to grow and take the place of the first leaders which have been weighed down.

In time, it will be found that the tree is built up of series of tiered branches radiating from the main framework. The object of building up the tree in this manner and spurring is to encourage a fruit-bearing habit. This is explained as follows:—As the fruit weighs the vertical branches down to a more horizontal position, the vigour of the branches is reduced and side shoots arising from such branches are, when spurred as outlined above, conducive to fruit production.

When shortening side shoots, the cuts should be made well back into ripe wood, thus throwing the sap into dormant buds. Light wood issuing from inside the more erect permanent arms may be retained, shortened for spurring, and from time to time renewed. No rank growth should be tolerated, unless it is required to continue the work of some displaced leader.

As the limbs drag down, it will be necessary from time to time to lift them by removing some of the lower limbs.

TREE PLANTING.

In many Tableland districts of New South Wales there is a serious timber deficiency for shade, shelter, fuel, fencing and other requirements. Mr. T. E. Hood, Tantaleon, Orange (N.S.W.), has outlined regeneration methods he has successfully employed. Writing in the January issue of *The Soil Conservation Service Journal*, Mr. Hood explains how he replanted much of his timber-bare land.

The propagation of trees from the seed of eucalypts is not beyond every landowner. It is a fascinating and economic project. Fresh seed gathered on the farm when the fruits are ripening and turning from green to brown, or just bursting and losing their seed, will germinate readily. Small branches carrying fruits can be broken off trees, carried home and stripped at leisure. The fruit can then be placed in an oatmeal bag and hung in the sun to dry. In a fortnight the seed can be beaten out by striking the bag against a wall.

A seed box containing half pure sand and half sieved leaf mould, or light soil, should be prepared in which to sow the seed. It must have good drainage. Before sowing, the soil should be thoroughly saturated with water and then the seed broadcast on the surface. No soil need be placed on top of the seed but a single thickness of light bagging should be laid on it to retain moisture. The box should be kept damp with light waterings.

Under warm spring or summer conditions, fresh seed treated thus will be up in five days. The bag should be lifted each day and with the first sign of germination it should be taken off at once and the box put in semi-shade. One watering per day will probably be ample from then on, as the seedlings are likely to damp off if given too much water.

Mr. Hood recommends that as soon as the seedlings have reached about half an inch in height they should be transplanted into pots, tubes or jam tins immediately. This move from the seed box should take place before the seedlings develop beyond the first juvenile two-leaf stage. The pots or tins should be filled with the same mixture of soil and sand as the seedbox and the same attention paid to drainage.

The area to be planted should have been fallowed and worked beforehand to retain all possible moisture. It should be securely fenced to exclude rabbits and hares which are most destructive. Weed growth must also be kept down for a year or two.

It must be remembered that we are handling a tree whose natural habitat is the open forest and that we are probably putting it into a paddock where it has no adult neighbors to shelter it from the fierce sun or drying wind. Also, let it be remembered, our soils now lack the humus contained in the original litter of the forest which meant so much to natural regeneration.

Consequently every means must be adopted to assist the seedling in its strange environment. In extreme cases a limited amount of watering may be necessary, but proper care will reduce this to a minimum.

Sizes and Specifications of Fruit and Vegetable Cases.

C. G. WILLIAMS, Supervisor, Preparation and Transport.

FREQUENT enquiry relative to the size and specifications of the various types of fruit and vegetable cases indicates that information on this subject is required by the grower and the case miller.

The information set out as follows is in accordance with "*The Fruit and Vegetables Acts,* 1927 *to* 1939," and the "Exports (Fresh Fruit) Regulations."

Case.	Inside Measurements.	Capacity.	Timber Specifications.	Remarks.
	Inches.	Cub. Ins.		
Tropical Fruit Case	24 3/4 long 12 wide 12 deep	3,564	Ends: 2 pieces, 6 x 3/4 x 12 inches Sides: 11 x 5/16 x 26 1/4 inches Tops and bottoms: 12 x 5/16 x 26 1/4 inches Four cleats: 2 x 5/16 x 12 inches	No piece to be under 3 inches in width Two 6 inches or three 4 inches pieces Used for marketing pineapples, papaws, granadillas, vegetable marrows, and carrots
Standard Banana Case	21 long 12 wide 12 deep	3,024	Apart from altered dimensions, construction to be identical with Tropical Fruit Case as above	Used for marketing bananas in Queensland and New South Wales
One Bushel Dump Case	18 long 8 2/3 wide 14 1/4 deep	2,223	Ends: 8 2/3 x 5/8 x 14 1/4 inches Sides: 13 1/2 x 1/4 x 19 1/4 inches Tops and bottoms: 1 each, 8 1/2 x 1/4 x 19 1/4 inches	Apple Export Case Used for marketing apples, pears, citrus, papaws, custard apples, mangoes, rosellas, cucumbers, beans, lettuce, and carrots
Canadian Standard Bushel Case	18 long 11 1/2 wide 10 1/2 deep	2,173 1/2	Ends: 11 1/2 x 5/8 x 10 1/2 inches Sides: Four—5 1/4 x 1/4 x 19 1/4 inches Tops and bottoms: Two each 5 1/2 x 3/16 x 19 1/4 inches Four cleats: 3/4 x 3/8 x 11 1/2 inches	Apple Export Case Used for marketing apples and citrus
*Long Bushel (Pear Flat)	26 long 6 wide 14 1/4 deep	2,223	Ends: 6 x 5/8 x 14 1/4 inches Sides: 13 1/2 x 1/4 x 27 7/8 inches Tops and bottoms: 6 x 1/4 x 27 7/8 inches	Export Pear Case No piece to be under 3 inches in width Except for pear export not recommended
Half Bushel Dump Case	18 long 8 2/3 wide 7 1/8 deep	1,111 1/2	Ends: 7 1/8 x 5/8 x 8 2/3 inches Sides: 7 x 1/4 x 19 1/4 inches Tops and bottoms: 8 x 1/4 x 19 1/4 inches	Export Case for apples and stone fruits Used for marketing tomatoes, passion fruit, grapes (made on the narrow side); citrus, custard apples, strawberry punnets, and persimmons
*Long Half Bushel	26 long 6 wide 7 1/8 deep	1,111 1/2	Ends. 6 x 5/8 x 7 1/8 inches Sides: 6 3/4 x 1/4 x 27 7/8 inches Tops and bottoms: 6 x 1/4 x 27 7/8 inches	Standard packing is difficult in this case due to the very narrow width Used for marketing tomatoes and passion fruit

* This case has a central division of the same dimensions as the end pieces.

Case.	Inside Measurements.	Capacity.	Timber Specifications.	Remarks.
	Inches.	Cub. Ins.		
Flat Half Bushel	18 long 11 3/4 wide 5 1/4 deep	1,110 3/8	Ends: 5 1/4 x 5/8 x 11 3/4 inches Sides: 5 1/4 x 1/4 x 19 1/4 inches Tops and bottoms: 12 x 1/4 x 19 1/4 inches Two lid battens: 2 x 3/8 x 12 inches	Very suitable for grapes, but not for grape export Used for marketing apricots, plums, peaches, passion fruit, and tomatoes
*Californian Citrus Case	24 long 11 1/2 wide 11 1/2 deep	3,174	Ends: 11 1/2 x 11/16 x 11 1/2 inches Sides and bottoms: Two boards—5 1/4 x 1/4 x 26 1/16 inches Tops: Two boards—5 1/4 x 3/16 x 26 5/16 inches Cleats: 3/4 x 3/16 x 11 1/2 inches	Citrus Export Case
Tray	18 long 14 1/4 or 11 1/2 wide Any depth not exceeding 4 inches	..	Thickness of timber may be similar to flat half bushel	Export, all fruits
One Quarter Bushel	13 3/4 long 10 1/8 wide 4 deep	556 7/8	Ends: 4 x 1/2 x 10 1/8 inches Sides: 4 x 1/4 x 14 3/4 inches Tops and bottoms: 10 x 1/4 x 14 3/4 inches	Used for marketing cherries, apricots, and cape gooseberries
Strawberry Punnet	8 long 4 wide 1 1/4 deep	40	16 oz. cardboard or chip (wood)	Used for marketing strawberries and cape gooseberries
Fig Box	8 1/4 long 6 wide 1 1/2 deep	76 1/2	Chip (wood)	Used for marketing figs

* This case has a central division of the same dimensions as the end pieces. An aperture 1/2 inch wide shall be allowed between boards, comprising the sides, bottom, and top. The inside top edges of the sides, end, and centre boards, shall be chamfered. The boxes shall be wired at each end against the inside edge of the cleat with the twitch on the side of the box and shall be centre strapped.

Vegetable Containers.

For vegetables such as cabbage, cauliflowers, peas, beans, potatoes, turnips, beetroot, carrots, and onions, etc., jute bag containers are commonly used.

Cabbage and cauliflowers have, in the past, been forwarded in chaff bags, but it is more desirable to forward these vegetables in open mesh bags, slightly shorter than the chaff bag. Chaff bags are too heavy and bulky in loading on and off high transport vehicles. A bag which would contain 10 to 15 cabbage or cauliflowers according to size is more suitable. Such a bag would be 40 inches deep by 30 inches wide and when packed contains approximately 110 pounds.

The Chapman sack is used for potatoes, and, to some extent, turnips and carrots.

Onions should be forwarded in open mesh onion bags, which are also used for the carriage of carrots, but it will be found that peas and beans have a tendency to sweat and rot in sugar bags in hot, humid weather.

Although the vegetables abovenamed are usually marketed in jute bags, they should be forwarded in fruit cases of suitable capacity over long distances.

For peas, and beans a thin hessian bag of the same dimensions as a sugar bag is used.

Some Notes on Construction.

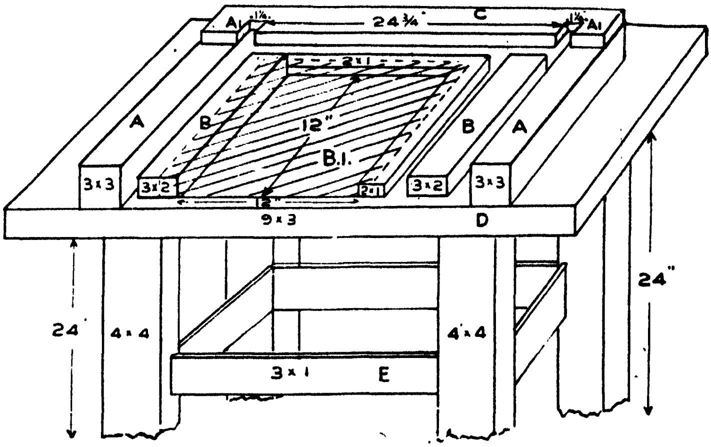


Plate 72.

TROPICAL CASE-MAKING BENCH, SHOWING METHOD OF ATTACHING CASE END, TEMPLATE AND NAIL CLINCHER.

SPECIFICATIONS:

Length.—42.50 inches;
Height:—(Underside of top), 24 inches;
Width:—24 inches;
Template:—As described.
Timber:—Legs, 4 inches x 4 inches;
Stops:—(A) Outside, 3 inches x 3 inches x 13½ inches;
(B) Inside, 3 inches x 2 inches x 12 inches;
(C) Back, 3 inches x 1 inch x 34 inches;
Top:—(D) 3 pieces 8 inches x 3 inches x desired length;
Stays:—(E) 3 inches x 1 inch.

DESCRIPTION:

The stops (A) and (B) are placed approximately 1½ inches apart, with the back stop (C) placed across the back ends of (A) and (B). A cut 1 inch deep and 1½ inches wide is made in the back stop to correspond with the slot between (A) and (B). The back end of this cut should be 12 inches from the front of the bench. The inside stop (B) is placed ½ inch from the front edge.

Template and Nail Clincher.

Many growers find difficulty in making up two-piece ends for fruit cases into correct widths owing, often, to the badly-cut timber. This can be easily overcome by attaching a template, in the form of a three-sided wooden frame, to the shed bench (Plates 72 and 74). A piece of flat sheet iron is placed to cover the space enclosed by the sides of the template. This acts as a nail clincher, turning the ends of the nails when the cleats used for joining the two pieces making the end are hammered on (Plate 73).

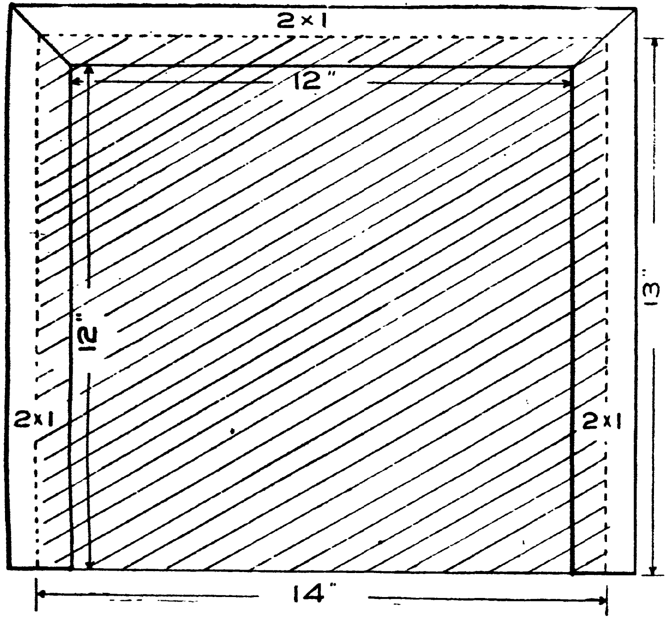


Plate 73.

NAIL CLINCHER AND TEMPLATE can be made separately or fitted to the case-making bench. The dotted line enclosing the shaded portion shows the shape of the piece of sheet iron. Invaluable for joining two piece ends.

The materials required are—

2 pieces wood 2 inches x 1 inch, 14 inches long;
1 piece wood 2 inches x 1 inch, 16 inches long;
1 piece sheet iron 14 inches x 13 inches x $\frac{1}{8}$ inch;
and necessary nails.

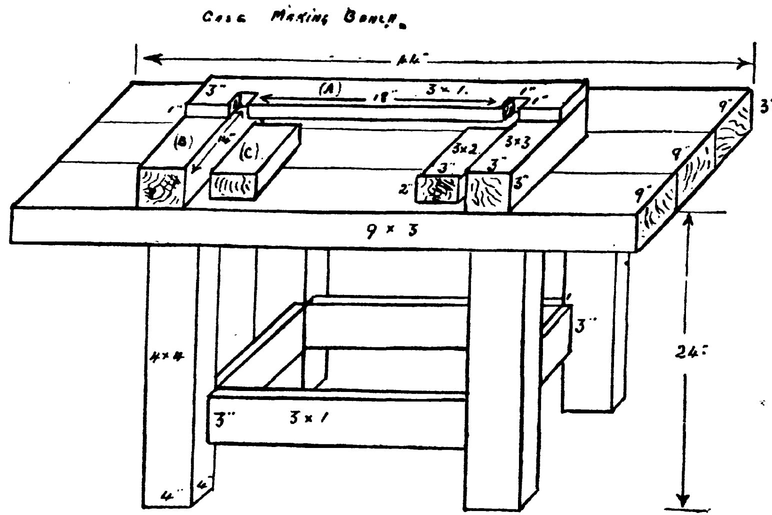


Plate 74.

CASEMAKING BENCH FOR MAKING AUSTRALIAN DUMP, CANADIAN STANDARD, BUSHEL AND HALF-BUSHEL CASES, AND OTHER FRUIT CASES, 18 INCHES IN LENGTH, INSIDE DIMENSIONS.

Specifications.

Height .. 24 inches from floor	Timber.—Legs	.. ..	4" x 4"
Width .. 27 inches	Inside	..	3" x 2" (C)
Length .. 44 inches	Stops—outside	..	3" x 3" (B)
	Back	..	3" x 1" (A)
	Top	..	9" x 3"
	Stays	..	3" x 1"

Casemakers' Nail Comb.

A nail comb (Plate 75) for picking nails up with all the heads in one direction will be found useful. The comb is made of a heavy piece of galvanized iron turned to clip on to the end of the nail box with a number of knitting needles soldered to the iron. The knitting needles are placed so that nails will slide between them easily, without dropping through, and remaining suspended by their heads in the comb. A comb with up to sixteen needles is a handy size for working, and will hold enough to make ten to fifteen cases. The needles are best placed with the ends shaped in a circular manner, the centre needles projecting about 6 inches and the side needles 5 inches. The comb is loaded by scraping or pushing it through the nails in the box. The cost of the comb is the price of four sets of knitting needles, and the necessary solder.

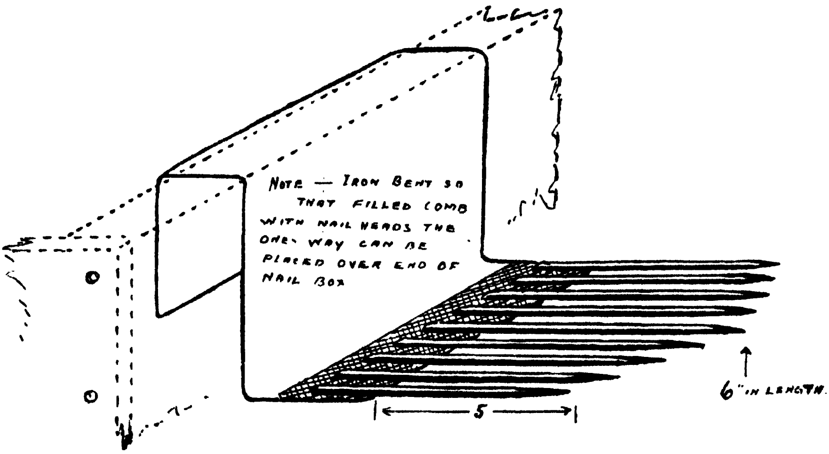


Plate 75.
CASEMAKER'S COMB.—Made of galvanised iron and knitting needles.

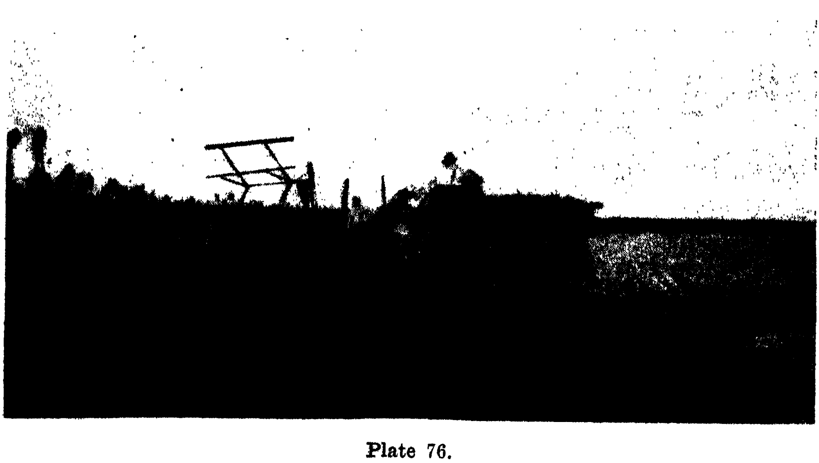


Plate 76.
HARVESTING SORGHUM FOR SILAGE ON CONDAMINE PLAINS.

VEGETABLE PRODUCTION

Cucumber Growing.

C. N. MORGAN, Horticulture Branch.

CUCUMBERS grow very well in Queensland. The vines like warm growing conditions though very hot weather tends to burn and consequently defoliate the plants, exposing the cucumber fruits and thereby rendering them liable to sunburn. Frost will kill the vines and they should therefore not be grown during winter on low-lying land.

The main planting is carried out in southern coastal districts during the months of July, August and September, and a further sowing is made during February and March in areas not subject to frost. On the Tablelands, such as at Stanthorpe, seed may be sown from September to January, whilst in northern coastal districts seed may be sown throughout the year except during the very hot months.

Planting.

Cucumbers require to be grown quickly in order to obtain good crops of crisp tender fruit. On land which is not particularly fertile, 5-6 cwt. of a quick-acting commercial mixture should be used as a base dressing, followed by a side dressing at the rate of 2 or 3 cwt. of a similar quick-acting fertilizer just before the plants commence to run. If using land which has just grown a winter crop, say of cabbage, which has been heavily fertilized, then it is only necessary to use half the quantity of fertilizer. All that would be necessary in this case would be to apply fertilizer along the rows where the cabbages have been removed, scuffle the area well a couple of times, open shallow drills and sow the seed. Seeds should be sown sufficiently thickly in the drills to provide for the thinning out of the young plants to one about every 18-24 inches. When established closely together in this manner, the vines cover the ground quickly, affording protection, and they also usually fruit earlier. When grown in rows approximately 3 feet apart, and spacing the plants as above, 2 lb. of seed should be sufficient to plant an acre.

Another method of planting is in what are known as "pits" or "hills." These terms are used to represent groups of three or four plants. At one time, the seed was sown always on small hills of soil formed by throwing together two or three shovelsful of soil, hence the name "hills." However, unless the land is inclined to be wet, there is no need to follow this practice. The method of planting in "pits" or "hills" is to fertilize small patches of ground about 4 feet apart, and to sow several seeds in each, about an inch below the surface. About four plants are allowed to grow in each "hill."

Should the vines send out their runners to a distance of two or three feet without setting any cucumbers, fruiting may often be assisted by pinching off the tips of the runners.

Protection from Winds.

Vines of all descriptions are particularly subject to damage from heavy winds. If the site is exposed, therefore, it is well to provide a breakwind of some kind. This applies more especially with an early crop sown say in July, which might be exposed to the westerlies that are usually experienced in August. A little thought on the part of the grower will soon overcome this problem. For example, thickly sown rows of a quick-growing crop such as Saccaline sorghum grown early in the year at say half a chain intervals, and allowed to remain for the cucumber crop, will afford a surprising amount of shelter from winds. If the breakwind tends to grow too high, and to shade the vines, it can easily be lopped back with a reaping hook to a height of about 30 inches. It is desirable to have rows running north and south for the early crop to obtain maximum sunshine and protection.

Harvesting.

Cucumbers usually take about three months from seed sowing to harvesting. The fruit should be picked when nearly full grown, before the seeds harden, and the skin begins to turn yellow.

Varieties.

Varieties recommended are Early Fortune, Kirby's Stay Green, Black Diamond and White Spine.

QUEENSLAND SHOW DATES FOR 1947.

May.

Kingaroy	1st, 2nd, and 3rd
Beaudesert	7th, 8th, 9th, and 10th
Blackall	13th and 14th
Kilkivan	16th and 17th
Ipswich	13th to 16th
Wondai	15th, 16th, and 17th
Charleville	21st and 22nd
Gayndah	21st and 22nd
Murgon	22nd, 23rd, and 24th
Esk	22nd, 23rd, and 24th
Warrilview	23rd
Goomeri	27th and 28th
Biggenden	29th and 30th
Gympie	29th, 30th, and 31st
Kalbar	30th
Blackbutt	30th and 31st

June.

Maryborough	5th, 6th, and 7th
Boonah	6th and 7th
Childers	9th and 10th
Gladstone	16th and 17th
Bundaberg	12th, 13th, and 14th
Lowood	13th, 14th, and 16th
Gin Gin	16th and 17th
Rockhampton	18th to 21st
Toogoolawah	20th and 21st
Mackay	24th, 25th, and 26th
Proserpine	27th and 28th

July.

Charters Towers	1st, 2nd, and 3rd
Kilcoy	3rd and 4th
Ayr	4th and 5th
Townsville	8th, 9th, and 10th
Rosewood	11th and 12th
Nambour	17th, 18th, and 19th
Gatton	18th and 19th
Cairns	22nd, 23rd, and 24th
Crow's Nest	30th and 31st
Laidley	25th and 26th
Innisfail	31st, and 1st and 2nd Aug.

August.

Lawnton	2nd
R.N.A., Brisbane	9th to 16th

September.

Rocklea	13th
Beenleigh	19th and 20th

PLANT PROTECTION

Seasonal Notes on Tomato Diseases.

J. E. C. ABERDEEN, Plant Pathologist, Science Branch.

Bacterial Spot.

THIS disease has been very prevalent over recent rainy months and will be apparent for some weeks after the present rainy season finishes. It is usually noticed by the grower at two stages in the history of a crop. The earliest appearance is in the seed-bed and in the field for the first week or so after transplanting. Spotting appears on both leaves and stems and is usually distinguished from target spot by the comparatively small size of the spots and the greater number of spots per leaf. It may be confused with the early stages of Septoria leaf spot, but the latter develops a grayish centre bearing dark pinpoint size fruiting bodies. The probable reason for bacterial spot being so often severe after transplanting is that the plant makes little growth for a week or so, while if rain is prevalent the bacteria spread freely.

With good growing conditions the plant outstrips the rate of infection and the disease will disappear unless further rain coincides with the period of fruit setting. This time the grower will not notice the disease until he is harvesting, but the damage is actually done when the fruit is very young and still showing a hairy skin. Once the skin of the fruit becomes smooth and waxy the bacteria cannot attack it. On the fruit the disease appears as a small, black, raised scab-like spot, which may increase in size to approximately one-eighth of an inch in diameter. The earlier the fruit is infected the larger the spot is finally. It ceases to increase in size after the fruit has matured and does not penetrate past the tissue immediately under the skin, and if any extensive rotting does occur it is due to other organisms entering the bacterial spot injury. As a result, fruit that is not too badly scabbed can still be marketed without fear of further rot developing.

The control of this disease during the rainy conditions favouring its spread appears to be impracticable with the sprays at present available. Copper sprays may check a mild infection only. Field evidence suggests that the chief sources of infection are the soil and seed. Consequently the most definite control recommendations are seed treatment with corrosive sublimate and sterilization of the seed-bed.

Irish Blight.

This is a disease likely to appear on tomatoes at any time from April onwards. It is some years since seasonal conditions were really favourable for the development of this disease, and as a result growers who did not experience some of the epidemics which occurred during

the period of the early thirties and years previous to that may have become a little casual in their use of copper sprays and dusts. Last winter being particularly dry also fostered this attitude. The ever-present target spot has served in a measure to keep growers aware of the necessity of copper treatments, but has not demanded the intensity of application that is necessary during a period of weather really favourable to Irish blight.

Either copper sprays or dust may be utilised to control this disease. Thoroughness of application is the most important factor, and a definite effort must be made to cover all the plant. If using dusts during the winter months it is wise not to use weaker strengths than 7 per cent. copper, and in the event of continued showers the grower should change over to a 10 per cent. dust. In comparing spray mixtures a 4-4-40 Bordeaux mixture or home-made cuprous oxide (1–10) is equivalent to 2 lb. to 40 gallons of any proprietary mixture containing 50 per cent. copper, or 8 lb. to 40 gallons of those mixtures containing 12½ per cent. copper. Commercial recommendations are usually at slightly weaker strengths than those mentioned above, e.g., 1½ lb. of a 50 per cent. compound to 40 gallons, but such are still within the range of suitable strengths providing the application is thorough.

A further important point for control of Irish blight is to start control measures before the disease appears. In fact, routine application of copper compounds should have been commenced already.

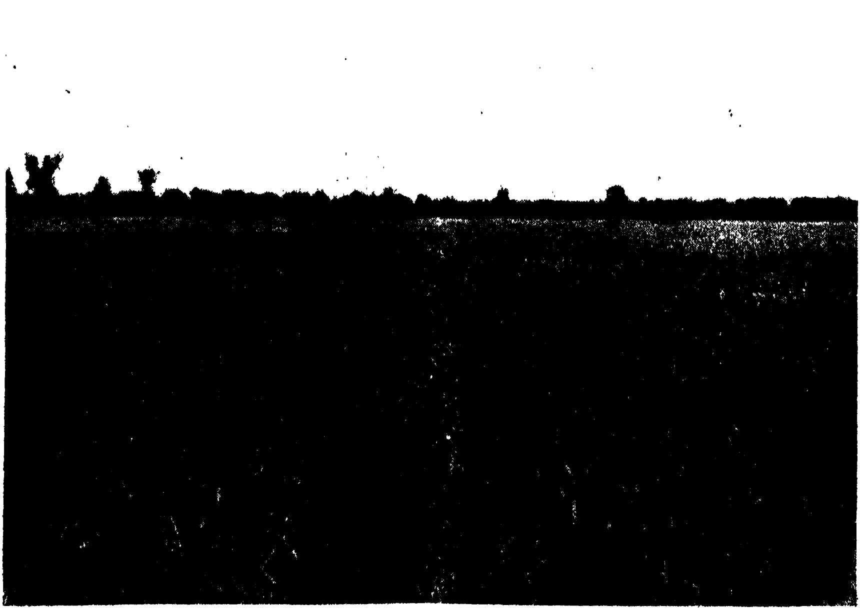
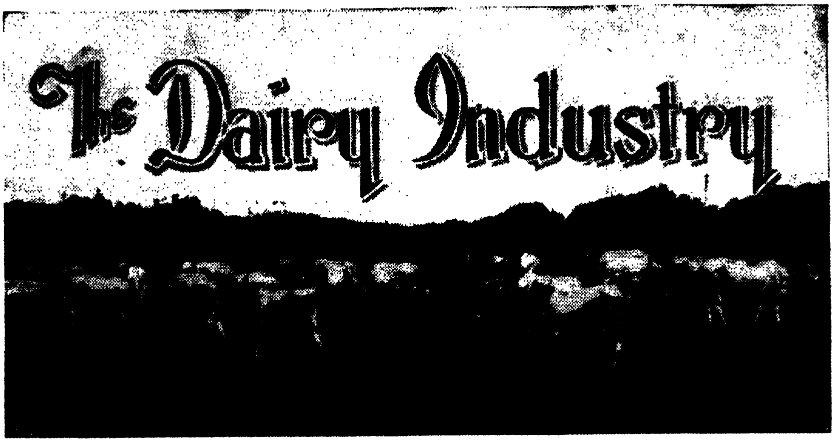


Plate 77.

A FIELD OF DWARF GRAIN SORGHUM NEAR GOONDIWINDI.



The Composition of Milk.

L. A. BURGESS, A.A.C.I.

MILK may be defined as the white fluid secreted by the mammary glands of female mammals for the nourishment of their young. The fluid which is most commonly called "milk" is that obtained from the cow. This animal, by a process of selection, has been developed to such an extent that certain types secrete much more milk than is required by its calf and this is utilised by man for his own nourishment. Milk obtained from the goat, camel, buffalo, ewe, mare, reindeer, and certain other animals is used in certain countries for the same purpose.

As a food, milk and its products are gaining favour. This is not surprising as each of the solid constituents has a definite food value. In fact milk has a greater food value than many of the common solid foods, as shown in Table 1.

TABLE 1.
COMPOSITION OF COMMON FOODS.

Foodstuff.	Protein.	Fat.	Carbo-hydrate.	Water Content.	Calories per 100 g.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Cabbage	1·6	0·3	4·5	94	27
Tomato	0·9	0·4	3·3	94	20
String Bean	2·3	0·3	5·5	90	34
Beet (Cooked)	2·3	0·1	7·4	89	40
Carrot	1·1	0·4	8·2	89	41
Milk	3·2	3·9	5·1	87·1	67-70
Apple	0·4	0·5	13·0	85	58
Potato	2·2	0·1	18·0	78	82
Egg	13·4	10·5	0	74	148

TABLE 2.

COMPOSITION OF MILK.

	Per cent.		Per cent.		Per cent.		Per cent.		Per cent.		Per cent.
Milk	100	Fat	3·9	Olein		Glycerides of insoluble and non-volatile fatty acids	3·4	Fat	3·9	Total Solids	12·9.
				Palmitin							
				Stearin							
				Myristin							
				Butyrin		Glycerides of soluble and volatile fatty acids	0·5				
				Caproin							
				Caprylin							
				Caprin							
				Laurin							
		Milk Serum	96·1	Casein	2·5	Total Proteins	3·2	S.N.F. (Solids not fat)	9·0		
				Albumin	0·5						
				Other Proteins	0·2						
				Lactose or		Milk Sugar	5·1				
				Potassium Oxide		Ash	0·7				
				Sodium Oxide							
				Calcium Oxide							
				Magnesium Oxide							
				Iron Oxide							
				Sulphur Trioxide							
				Phosphorus Pentoxide							
				Chlorine							
				Others in Traces							
				Water							87·1
											100·0

The average composition of cow's milk is as follows:—

	Per cent.
Water	87·1
Fat	3·9
Proteins	3·2
Lactose	5·1
Mineral ash	0·7

It is shown in greater detail in Table 2.

Other constituents which are present in smaller quantities, but which play an important physiological role include enzymes, vitamins, iodine, lecithin, and cholesterol. Dissolved gases such as oxygen, nitrogen, and carbon dioxide are also found in milk.

Water.

The water of milk is the same colourless liquid which is known to everyone.

In milk it serves two important purposes. Firstly, it holds the other constituents in suspension or in solution. The lactose and portions of the ash and proteins are dissolved, while the fat and the remainder of the proteins and ash are suspended in the form of very small particles. The food constituents are therefore in a condition capable of being immediately digested without the need of mastication.

Secondly it dilutes the solids to such a bulk that it forms the perfect food for the calf. With less water, the solids would form a too concentrated food for the delicate digestive organs of the young animal.

These are some of the reasons why milk is such a valuable food for children and invalids.

As water comprises such a large proportion of milk, and the cow in addition requires water to sustain its own life, a liberal supply of good clean drinking water should always be available. An average of fifteen gallons of water per day is required by a cow in milk.

The constituents other than water are known as milk solids. These may be divided into "fat" and "solids not fat."

Milk Fat.

Fats are complex substances and consist of a fatty acid such as palmitic acid combined with glycerol or glycerine. In the making of soap an alkali combines with the acid and glycerine is recovered as a by-product.

Milk fat is not the simple substance it appears. It is a mixture of at least nine fats, which are given in Table 3.

Some of these are liquid at ordinary temperatures; others are solid, the mixture of the liquid and solid fats forming the substance known to all as milk fat or butter fat. Various factors influence the proportions of the constitutent fats. Young succulent grass causes the proportion of the liquid fat olein to increase, and a softer fat is therefore obtained in spring and early summer following the response of the grass to rain and warm weather.

The fat exists in milk in the form of very minute globules which are in a state of suspension throughout the milk serum; this being the name given to that portion of milk other than fat. These fat globules vary in size with the breed of the cow and a number of other factors,

but the average diameter of a globule is one ten-thousandth part ($\frac{1}{10{,}000}$) of an inch. To give some idea of their very small size, one drop of milk may contain from 100,000,000 to 150,000,000 fat globules.

TABLE 3.

COMPOSITION OF MILK FAT.

Fat.	Per Cent.	Melting Point °F.	Condition at Ordinary Temperature.	Properties of the Fatty Acid.
1. Butyrin ..	4	about -80	Liquid ..	Soluble and volatile
2. Caproin ..	3·5	..	ditto ..	ditto
3. Caprylin ..	0·5	16	ditto ..	Partly soluble and volatile
4. Caprin ..	2	31	ditto ..	ditto
5. Laurin	7	44	ditto ..	ditto
6. Stearin ..	2	123	Solid ..	Insoluble and non-volatile
7. Myristin ..	20	88	ditto ..	ditto
8. Palmitin ..	26	145	ditto ..	ditto
9. Olein	35	41	Liquid ..	ditto

Solids not Fat.

The solids not fat consist of lactose, proteins and the mineral ash.

Lactose.

Lactose, or milk sugar, is only found in nature in mammalian milk. It contains the same elements, namely, carbon, hydrogen, and oxygen, and in the same proportion as in sucrose or cane sugar, but differs in certain of its physical and chemical properties. It is less sweet to the taste and is not so soluble in water as is cane sugar. It is one of the constituents which is entirely in solution. It is easily decomposed by lactic acid bacteria when in solution, with the formation of lactic acid. This bacterial action is the cause of the souring of milk, and is one of many changes which occur during the manufacture of cheese. Other kinds of bacteria may form other acids as well as gas and it is these products of undesirable types of bacteria which cause off flavours and other defects in milk.

Proteins.

The proteins of milk consist mainly of casein and albumin with a smaller proportion of globulin. Casein forms about 2·5 per cent. of milk. It exists in the form of an exceedingly fine colloidal suspension. There are reasons to believe that it is loosely combined with calcium or lime compounds.

The presence of casein makes the manufacture of cheese possible. As milk sours casein is coagulated, or precipitated, and this solidification of the casein traps much of the fat and lactose. Cheeses made from such sour milk curd include what is generally known as cottage cheese. When rennin, or rennet, is added to milk, the casein is again coagulated but in this case, the curd contains more of the mineral constituents of milk, notably calcium. This curd is the source of most varieties of cheese, the different varieties depending on the after treatment of the curd and the action of different types of bacteria.

In addition to its value as a foodstuff, casein has a considerable commercial value. It finds use in the plastics industry in the manufacture of artificial jewellery, imitation bone and ivory, buttons, imitation amber and ebony, and in cold water paints, leather dressings, waterproof glues, paper sizing, horticultural sprays, and in a number of other ways.

Albumin, the other main milk protein, is present to the extent of about 0·5 per cent. This protein differs from casein, being in solution in the water portion. It differs also in not being coagulated by souring or by the action of rennin. However, by heating milk above 158 degrees F., for any appreciable time, albumin is coagulated, while casein remains unchanged unless heated under pressure above 250 degrees F.

Globulin is present in considerable proportion in colostrum, the fluid first secreted after the calf is born. The percentage of globulin rapidly decreases and after five to ten days remains constant at about 0·2 per cent.

Ash.

The mineral portion of milk is generally known as ash. It is not known in what manner the mineral matter is arranged or combined in milk, but the following constituents are all present in the ash:—Sodium, potassium, calcium, magnesium, iron, phosphorus, chlorine, sulphates, carbonates, and smaller quantities of other substances.

Pigments.

Milk contains two pigments. One, called carotin or carotene, is yellow, is dissolved in the fat and causes the familiar yellow colour of butter. It is closely related to vitamin A and it has, in fact, some vitamin A activity. It is derived from green plants and is carried by the blood stream into the milk. The second pigment is found in the serum or watery portion of milk and causes whey to have its greenish-yellow colour. Previously known as lactochrome this pigment is now known to be riboflavin, one of the members of the B group of vitamins.

Vitamins.

A description of the constituents of milk would be incomplete without mentioning the vitamins known to be present in milk.

Vitamin A is present in the milk fat. This vitamin is essential for the maintenance of good health inasmuch as its absence from the diet results in a lowered power of resistance to disease, particularly diseases of the throat and lungs. Milk, cream, butter, cheese, and other milk products which contain milk fat are, therefore, of considerable value. Any excess of this vitamin which may be taken into the system is not wasted as it is stored in the liver until such times as it is required. Most vegetable oils are lacking in this particular vitamin. As stated previously carotene is related to vitamin A and is partly responsible for the vitamin A activity of milk fat.

Vitamin B was originally regarded as one substance capable of preventing a number of diseases and essential in the treatment of them. It is now well established that the original vitamin B is a complex mixture of substances which investigators are now unravelling. Members of this group already known include the following:—

Thiamin or Vitamin B1		Prevents beri-beri in humans. Somewhat affected by heat.
Riboflavin	Vit. B2 Group. Stable to heat.	Growth promoting and health stimulating.
Nicotinic acid		Prevents pellagra in humans.
Pantothenic acid		Still under investigation.
Pyridoxine		
Others		

Milk is a good source of the vitamin B complex, the constituents of which are all water soluble.

Vitamin C is also soluble in water and is essential for the prevention of scurvy. Although citrus fruits are the chief sources of this vitamin, it is also present in milk in useful amounts. It is now known to be ascorbic acid.

Vitamin D is a fat soluble vitamin known as the anti-rachitic vitamin. This vitamin prevents such complaints as rickets, provided sufficient lime and phosphoric acid are also available in the diet. Milk fat is a valuable source of this vitamin, while vegetable oils contain practically none. A number of vitamins D are probable, one already known being calciferol.

Vitamin E is also a fat soluble vitamin and a lack of this vitamin results in the sterility of certain animals. This vitamin is considered to be more widely distributed among the foods than most of the other vitamins, and milk is said to be one of the secondary sources of supply. The vitamin is now known as A (alpha)-tocopherol.

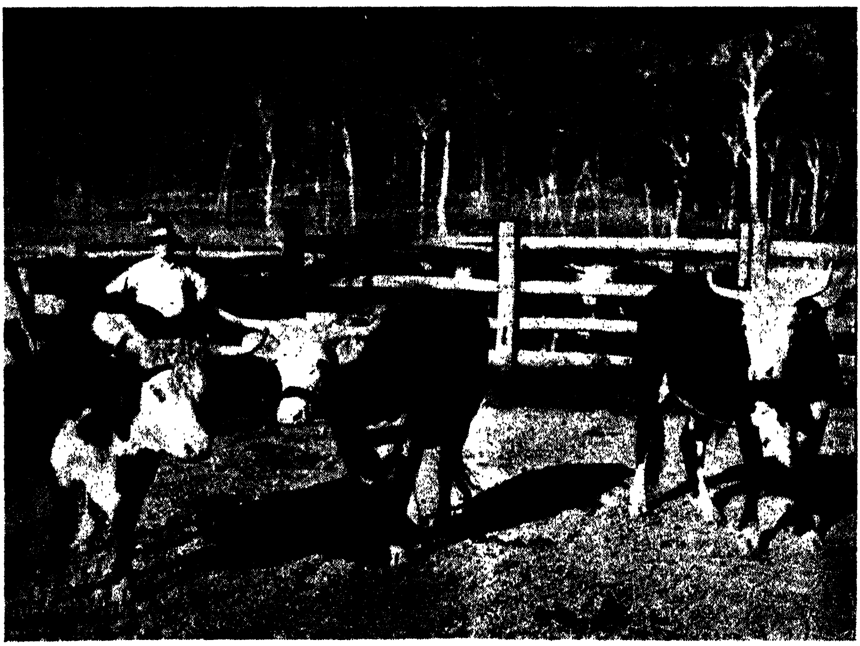


Plate 78.
SOME KINGPAH BULLOCKS.—The property of Mr. J. Faulkner.

A Non-Fat-Leaking Cheddar Cheese.

L. E. NICHOLS, Division of Dairying.

WAR conditions necessitated many modifications in food processing. Dairying is one industry which was affected. In view of the importance of cheese as a war-time foodstuff and its possible production as an alternative to butter at the time when refrigerated shipping was difficult to secure, efforts were made, in conjunction with the Queensland Butter Board, to produce a cheese which might be shipped as unrefrigerated cargo. As cheddar cheese sweats freely at high atmospheric temperatures, the possibilities too of non-fat-leaking cheese in warmer climates and the tropics could not be overlooked. In the course of the experiments approximately one hundred tons of non-fat-leaking cheese were made.

Principle of Process.

The underlying principle of the modified process is to homogenise the milk, reducing the fat globules to a size not exceeding 1/12,000th inch in diameter. The smaller the fat globules and the greater their dispersion the greater the resistance to fat leakage of the resultant cheese. Furthermore, it was found that a physical breakdown of the casein of homogenised wholemilk during cheesemaking, causing a soft curd, necessitated the separation of the milk and its reconstitution after homogenising the cream. It was also found necessary to maintain a temperature of 160°F. throughout separation, homogenisation and reconstitution to ensure complete destruction of fat-splitting enzymes.

Pasteurisation.

The milk is pasteurised at 160°F. If necessary, during the summer months, it is neutralised to 0·18 per cent. lactic acid, which increases the efficiency of separation and homogenisation.

Separation.

The heated milk is taken direct from the pasteuriser to a high-power centrifugal (preferably foamless type) separator of 1,500 gallon-an-hour capacity, where it is separated to approximately 40 per cent. fat content cream. This gives efficient skimming, the fat content of the separated milk averaging 0·02 per cent. by the normal butyl alcohol modification of the Babcock test. Although milk fat tests up to 0·08 per cent. on the separated milk do not affect fat leakage of the cheese, efficient separation is desirable.

The clarifying effect of separation removes much slime, dirt and cellular material from the milk, and benefits quality. To reduce frothing, the separated milk is gravitated into the reconstituting vat through a very fine gauze, stainless steel strainer.

At the cream outlet of the separator sodium citrate as an emulsifier is added, by means of a drip system, at the rate of 0·75 per cent. One part of emulsifier is dissolved in three parts of water. The emulsified cream is then "boosted" in temperature by passage through a tubular heater to ensure 160°F. during homogenisation, and gravitated to a stainless steel holding vat adjacent to the homogeniser.

Homogenisation.

The cream is diluted with an equal volume of hot water at 160°F. in the holding vat to reduce its fat content to 20 per cent., which was found necessary for efficient results. The diluted, emulsified cream is then homogenised in a 270 gallon-an-hour capacity, three-phase homogeniser at pressures of 2,200, 650 and 150 lb. per square inch in the first, second and third phases, respectively. The pressures are accurately checked both on the pressure gauge and electrically by means of an ammeter. By-passes ensure that all cream is subjected to uniform pressures and that there is a continuous flow of homogenised cream to the reconstituting vat.

Reconstitution.

The separated milk and homogenised cream are reconstituted at the same temperature in the stainless steel reconstituting vat near the separated milk spout of the separator. This ensures minimum frothing. After reconstitution the milk is pumped over the cooler for cooling to setting temperature, and then gravitated to the cheesemaking vat. Biologically, the milk is improved for cheese manufacture by the clarification during separation and the continuous heating throughout pasteurisation, separation, homogenisation and reconstitution. These processes are continuous.

Variations from Normal Cheddar Cheese Making.

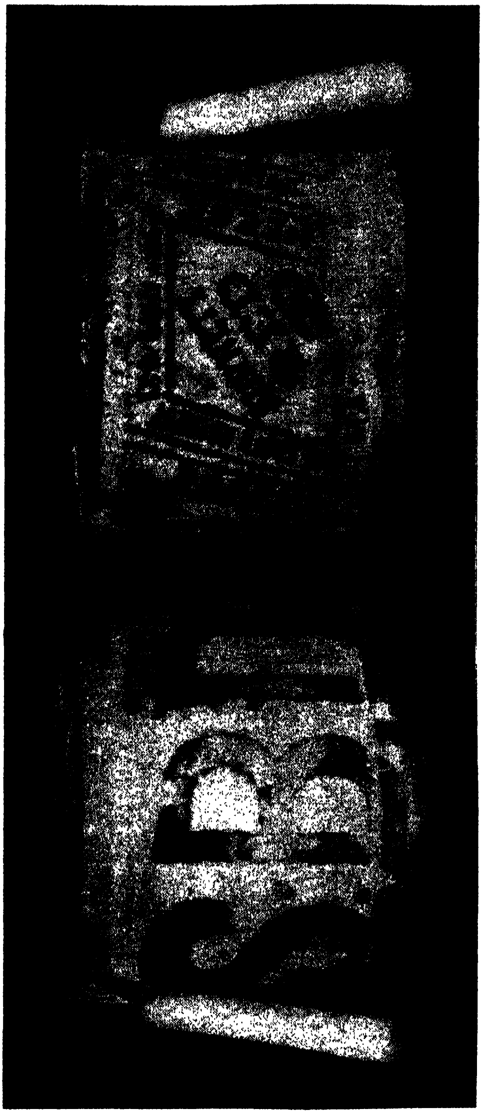
The altered physical characteristics of the reconstituted milk necessitate minor variations from normal cheddar manufacture. Lower acidities are needed at various stages than for the normal cheddar process because of the moisture retained by the curd and the longer "cooking" time. In view of the comparatively soft curd, a renneting or setting temperature 2° higher than in normal cheddar cheesemaking is recommended. Therefore the milk should normally be set at 88°F. Because of the neutralising effect in solution of sodium citrate emulsifier, as well as the neutraliser (if used), twice the normal quantity of rennet is used to set the milk.

The curd is cut finer than in normal cheddar practice and must be handled very gently. After cutting, it is stirred gently by hand for approximately ten minutes, followed by "slow gear" mechanical agitation for a further ten minutes, and finally "top gear" agitation. This prevents a cloudy whey and a flaky, crumbly curd, which would be rough after cheddaring.

The larger surface area of the fat globules gives rise to difficulties in the control of the moisture content of the curd and cooking temperatures from 2° to 4° above normal are necessary. The use of a thermoduric starter culture, in association with a normal lactic streptococcus culture, is also advised.

In "cooking" a comparatively slow "cook" to a high temperature is necessary for effective moisture control. The temperature is raised to 104°-106°F., as the casein/fat ratio demands, in approximately 40 to 50 minutes. The lower acidities during manufacture permit of a longer cooking time.

The whey is drawn when the acidity is 0·16 per cent., the curd then being firm, shotty, bright and well shrunken. One or two "breaks" can be given if the curd is inclined to be soft.



ORDINARY CHEDDAR CHEESE BEFORE HEATING. HOMOGENISED CHEESE BEFORE HEATING.

It will be noted that texture and condition of the homogenised cheese compares favourably with normal cheddar.

Plate 79.

In order to control the moisture content, as well as the formation of the desired texture, special attention must be given to cheddaring homogenised cheese. At the commencement of cheddaring the acidity of the whey (0·22-0·24 per cent.) is lower than for normal cheddar cheese practice; otherwise normal cheddaring is carried out. A short, rough, crumbly texture results from defective cheddaring, and the finished product is dry and crumbly.

Standard cheddar cheesemaking practices are followed beyond this stage.

HOMOGENISED CHEESE.
After heating at 120 deg. F. for 18 hours.

ORDINARY CHEDDAR CHEESE.
After heating at 120 deg. F. for 18 hours.

Plate 80.

Fat Retention in Cheese.

After prolonged incubation at temperatures ranging from 100° to 130°F. fat leakage is negligible and shape, condition and appearance are unaffected, while normal cheddar cheese exudes fat profusely at 90°F., and at 120° F. becomes misshapen, and finally a molten mass (see Plate 80).

Comparative fat losses, determined on midget (1 lb.) normal and homogenised cheeses, respectively, were:—

Temperature.	Incubation Period.	Fat Loss. Homogenised Cheese.	Fat Loss. Normal Cheddar Cheese.
105°F.	6 hours	nil	6 per cent.
106°F.	24 hours	0·5 per cent.	10 per cent.

There is an appreciable increase in yield of cheese compared with normal methods. This is due to the higher moisture content (38-40%) and lower percentage of the milk-fat lost in the whey. The new cheese also ripens more rapidly, developing a cheddar flavour in four to six weeks, in comparison with at least four months for normal cheese. The keeping quality is satisfactory and official gradings of the cheese compare favourably with normal cheddar cheese.

The cost of manufacturing cheese from homogenised milk is somewhat greater (in these trials, 1·3d. per lb. compared with 1d. per lb. for cheddar), but higher yield per gallon of milk or pound butterfat and more rapid ripening more than compensate for the additional cost.

It is considered that this cheese also offers promise of being marketed as a rindless cheese, which, if hygienically and attractively packed, should prove palatable and popular with consumers.

Acknowledgments.

It is desired to acknowledge the facilities provided by the South Burnett Co-operative Dairy Association Limited, Murgon, and the assistance given by the Manager, Mr. P. Sing, and staff. Financial aid towards purchase of equipment was given by the Queensland Butter Board. Officers of the Division of Dairying also gave much assistance in the factory trials.

DAIRY PRODUCTION COSTS IN AMERICA.

The observations of Mr. G. C. Howey (Australian Dairy Farmers' Federation), who, in company with Mr. Chris. Sheehy (Commonwealth Dairy Produce Controller) returned recently from a mission overseas, on the conditions of dairying in the United States have a particular interest for Queensland dairy farmers. According to a Press statement, Mr. Howey said that the cost of production of butter at the farm was not less than 4s. a lb. butterfat, and, with the higher cost of living, the American dairy farmer was little, if any, better off than his Australian counterpart. Fortunately for him, he could sell his produce on the home market as the United States were barely self-supporting in dairy produce. He had not a chance on the export market against countries such as Australia and New Zealand.

Unlike America, Canada had done a good job in pegging prices, Mr. Howey said. Ten cents were gained in Canada on each American dollar changed.

Dollars went much further, while costs to the producer were not so high as the result of price pegging.

While values for produce were much higher in America so were working costs. A farm labourer received 125 dollars a month with keep (about £40 Australian currency).

A two-year-old spring grade heifer was worth 165 dollars (£A55), and a farm capable of carrying 20 cows would cost 40,000 to 50,000 dollars (almost £A700) per cow compared with Australian value of £100 per cow; American values would include herd and plant.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the advanced register of the A.I.S. and Jersey Societies' Herd Books, production records for which have been compiled during the month of March, 1947 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.)			
Mountain Home Gentle 16th	M. C. Lester, Glengallan, Warwick	10,903·6	430·588	Sunny View Alert
Fairlie Favourite 33rd	Mitchell and Mulcahy, Warwick	9,341·8	421·653	Rosenthal Perfection
Fairlie Princess 38th	Mitchell and Mulcahy, Warwick	8,541·3	368·405	Fairlie Credence 2nd
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Mountain Home Envy 2nd	M. C. Lester, Glengallan, Warwick	10,263·6	387·141	Fairvale Ensign
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Penrhos Pansy 15th	A. Sandilands, Warwick	6,181·65	252·383	Fairlie Clubman
	JERSEY.			
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Palen Golden Lass	Prison Farm, Palen Creek	4,634·5	231·294	Banyule Silvermine Oxford

ANIMAL HEALTH

Ticks Infesting Domestic Animals in Queensland.

F. H. S. ROBERTS, Animal Health Station, Yeerongpilly.

TICKS are notorious parasites of domestic animals and birds throughout the world. They are responsible for serious economic loss, which is brought about in two ways. Firstly, ticks live on blood and the loss of blood and the irritation caused by an infestation frequently result in a condition known as tick worry, which in itself can be fatal; and, secondly, many species are vectors of serious diseases. Tick-borne diseases are found wherever ticks occur but are most prevalent in tropical and sub-tropical areas. The more important include various typhus fevers, relapsing fevers, and tularaemia of man; redwater, east coast fever, and gallsickness or anaplasmosis of cattle; Nairobe disease, biliary fever, louping ill, and heartwater of sheep; biliary fever of dogs and horses; and spirochaetosis of poultry. Four of these are present in Queensland, namely tick-borne typhus or Q fever of man, redwater and anaplasmosis of cattle, and spirochaetosis of poultry. There is also a number of species which cause a condition of paralysis, frequently fatal, in domestic animals, and one of the Queensland species is of importance here.

Fifteen species of ticks are recorded as attacking domestic animals and birds in Queensland. Some are native species, whilst others have been introduced from other countries. Eight are of common occurrence. Five are found on cattle, sheep, and horses; two others are seen on dogs; and two on poultry. These ticks can be readily distinguished from one another. In this article the important distinguishing features are given and, with the aid of a good hand lens, an identification should be possible. It must be realised, however, that for the sake of accuracy and to avoid the possibility that a species not referred to in these notes is concerned, any identification so made should be checked by the laboratory.

Care must be taken when detaching ticks from their host for identification purposes. The mouthparts are essential for this purpose and ticks plucked from the skin usually leave these behind. A slow, gentle pull will usually remove the tick with its mouthparts intact. The specimens are then placed in a bottle or tin which is packed with soft paper to prevent ticks being thrown about in the post. Information accompanying specimens should include—(*a*) name of animal or bird, (*b*) date, (*c*) locality, (*d*) name of collector, (*e*) any other relevant information, such as state of health of host, degree of infestation, &c.

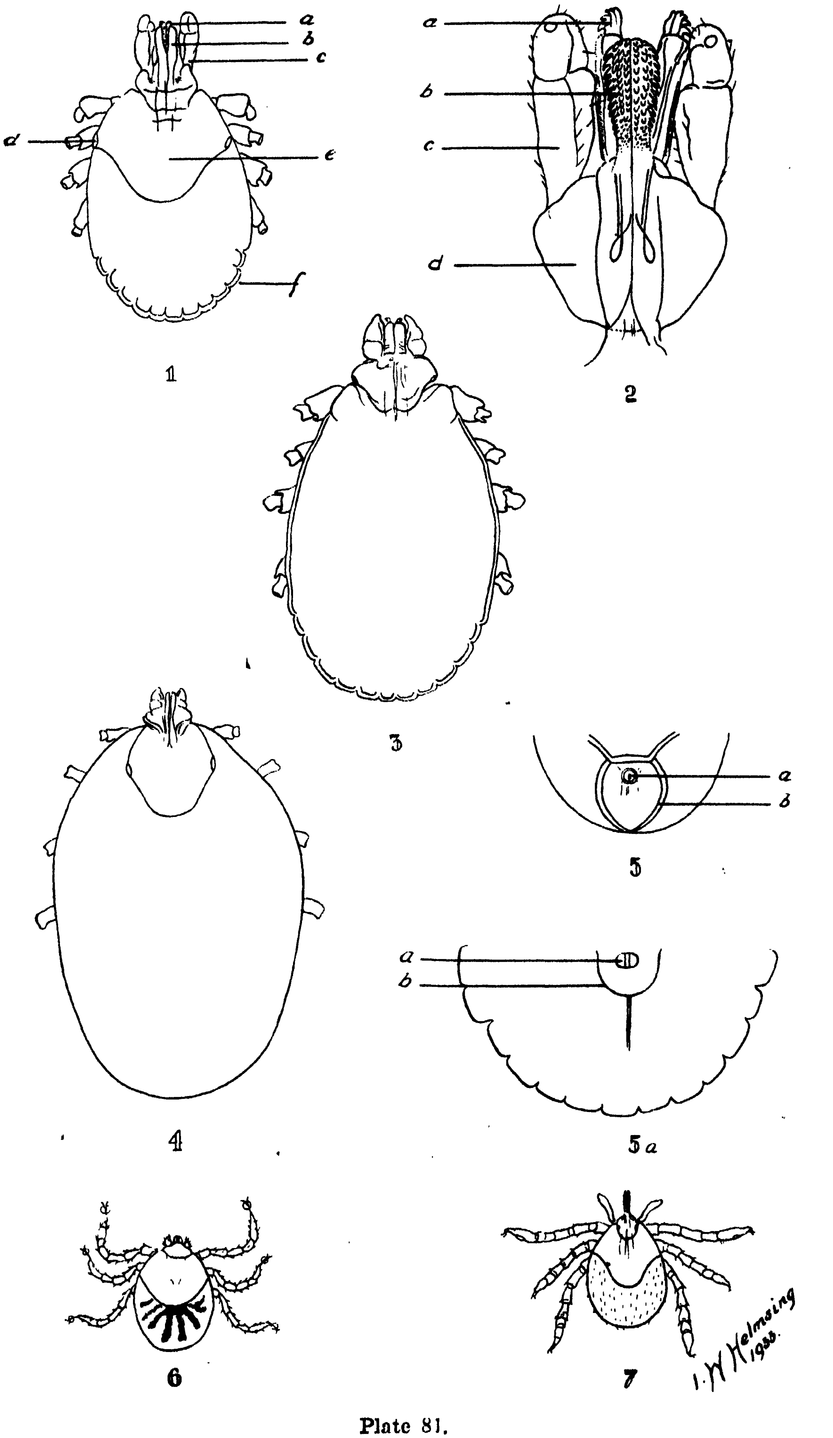


Plate 81.

STRUCTURE OF TICKS.

A tick is composed of (*a*) the body, (*b*) the mouthparts, and (*c*) the legs.

The Body.

The upper surface of the body is referred to as the dorsal surface and the under surface, to which the legs are attached, as the ventral surface. The various parts of the body which are used for identifying the species discussed here consist of the scutum, or dorsal shield, the eyes, the anal groove, the general opening, and the festoons.

The Scutum (*Dorsal Shield*):

This is a hard chitinous shield which is seen on the dorsal surface. It is present in all ticks except the fowl tick and its relatives. In unengorged females, the scutum covers about half the dorsal surface (Plate 81; fig. 1). As the female fills up with blood and the body enlarges, the scutum, whilst not diminishing in size, covers a much smaller area of the body (Plate 81; fig. 4). The male tick does not increase in size like the female and the scutum always covers practically the whole of the dorsal surface (Plate 81; fig. 3). In some species the scutum is said to be ornate when it is prettily ornamented with coloured patterns; in most of our ticks, however, it is inornate and is uniformly brownish or yellowish.

The larva and nymph also possess a scutum (Plate 81; figs. 6 and 7).

The Eyes.

Some ticks possess eyes, others are blind. The eyes are relatively small, smooth, pale, globular areas at the sides of the scutum (Plate 1; fig. 1 (*d*)). They are frequently difficult to detect and a little experience is required before it can be said whether eyes are present or absent.

The Anal Groove.

On the ventral surface of the body and towards its posterior margin, there is a small rounded opening called the anus. In some ticks a distinct semi-circular groove, the anal groove, can be seen encircling the anus from in front (Plate 81; fig. 5); in others, this groove encircles the anus from behind (Plate 81; fig 5a); whilst, in a few species, the anal groove is absent.

DESCRIPTION OF PLATE 81.

STRUCTURE OF TICKS.

FIG. 1: Dorsal view of a female tick showing (*a*) chelicerae, (*b*) mandibular sheaths which enclose the chelicerae, (*c*) palps, (*d*) eyes, (*e*) scutum, (*f*) festoons.

FIG. 2: Capitulum, ventral view, showing (*a*) chelicerae, (*b*) hypostome with rows of teeth, (*c*) palps, (*d*) basis capituli.

FIG. 3: Dorsal view of a male tick, showing scutum covering most of the back; compare scutum in the female in Fig. 1.

FIG. 4: An engorged female showing small area of back covered by scutum.

FIG. 5: The anal groove is shown encircling the anus in front; (*a*) anus (*b*) anal groove.

FIG. 5a: The anal groove is shown encircling the anus behind; (*a*) anus, (*b*) anal groove. The festoons are clearly seen.

FIG. 6: Larva of the common cattle tick, *Boophilus annulatus microplus.*

FIG. 7: Larva of the scrub tick, *Ixodes holocyclus.*

Festoons.

In many species, particularly in the males, unengorged, and semi-engorged females, the hind margin of the body is divided into a number of distinct small folds or festoons (Plate 81; fig. 1 (*f*)), less conspicuous in engorged females because of the enlargement of the body. In other species, festoons are never present.

The Genital Opening.

Situated in the mid-ventral line and towards the anterior pairs of legs is a slit-like opening, the genital opening (Plate 84; fig. 4 (*b*)). It is present only in mature males and females, and hence is a character which distinguishes the nymph from the adult.

The Mouthparts.

In one group of ticks, these are on the ventral surface and can be seen only when the tick is turned over on its back. In the second group, the mouthparts are terminal at the anterior end and readily visible. The mouthparts are part of the capitulum or head (Plate 81; fig. 2), the base of which is called the *basis capituli*, and consist of (*a*) a *hypostome*, a club-shaped structure covered with rows of recurved teeth, and (*b*) a pair of cutting organs or *chelicerae*. A pair of palps are external to the hypostome and chelicerae. In some species the palps at their bases project beyond the *basis capituli* when they are said to be salient laterally (Plate 84; figs. 1 and 3).

The length of the mouthparts and palps in comparison to the length of the body of the tick is of value in determining a species. In some ticks, the mouthparts are relatively long (Plate 83; figs. 5 and 6) and in others short (Plate 83; figs. 1-4).

The Legs.

There are four pairs of legs in the nymph and adult and three pairs in the larva. Each leg is fixed to the body by the *coxa* (Plate 84; fig. 4), and is composed of a number of moveable joints. The coxae are frequently provided with spurs or thick spines and the number and size of these is used for identifying the various species. As engorgement proceeds, the legs appear to get smaller, but this is only because the body increases in size.

LIFE HISTORY OF TICKS.

There are four stages in the life history of a tick, namely, egg, larva, nymph, and adult.

The Egg.

The eggs are small, rounded, and usually pale when first deposited, gradually darkening as the time for hatching approaches. They are deposited in heaps in the soil or debris away from the host.

The Larva.

The larva or seed tick, which hatches from the egg, has only three pairs of legs (Plate 81; figs. 6 and 7). It crawls up the vegetation and attaches to a host when opportunity offers and on finding a suitable spot settles down and commences to suck blood. When it is fully engorged, it is ready to enter the nymphal stage.

The Nymph.

The larva becomes a nymph after shedding its skin or moulting. The nymph has four pairs of legs and resembles the adult but is much smaller and has no genital opening. This stage then feeds on a host and when fully engorged prepares to enter the adult stage. In some ticks there are two nymphal stages.

The Adult.

The engorged nymph moults and gives rise to either a male or a female adult tick. The adult female attaches to a host, engorges with blood and then drops off to lay eggs. The male is smaller than the female and is an intermittent feeder, passing its lifetime wandering about the body of the host in search of females.

Three types of life history are seen among Queensland ticks:—

(1) The larva attaches, engorges, and drops off to moult to the nymph. The nymph, in turn, attaches, engorges, and drops off to give rise to the adult. Finally, the adult attaches and, if a female, engorges and drops off to lay her eggs and then dies. This life cycle requires three hosts and the tick is known as a *three-host tick*. The scrub tick, the dog tick and the New Zealand cattle tick are *three-host ticks*.

(2) In the common cattle tick, the life cycle with its moults from larva to nymph and nymph to adult takes place without the tick ever dropping from its host except as an engorged female to lay eggs, after which she dies. This is a *one-host tick*.

(3) In the poultry tick, the larva is the only stage which attaches to the host for any length of time. The adult and nymph hide away during the day in cracks and crevices and feed only at night. The female lays several batches of eggs during her lifetime.

COMMON SPECIES OF TICKS.

The Poultry Tick (*Argas persicus*) (Plate 82; figs. 7 and 8).

This is a flat, oval, leathery tick without a scutum and with ventral mouthparts. The dorsal surface is marked with numerous discs more or less arranged in radial lines. The margin of the body is always thin.

It is a cosmopolitan species and attacks fowls, ducks, pigeons, and caged birds. It is widespread throughout the State and thrives in the dry, far western areas.

It is a vector of fowl tick fever or spirochaetosis, which is a frequent cause of serious mortalities.

The Inornate Kangaroo Tick (*Ornithodoros Gurneyi*).

This species deserves mention because it is so well known to the people of Western Queensland. Its habits are very similar to those of the poultry tick in that it visits its host only to feed.

It is a brownish leathery species, with ventral mouthparts that are protected by a "hood" which on each side is divided into a number of finger-like processes.

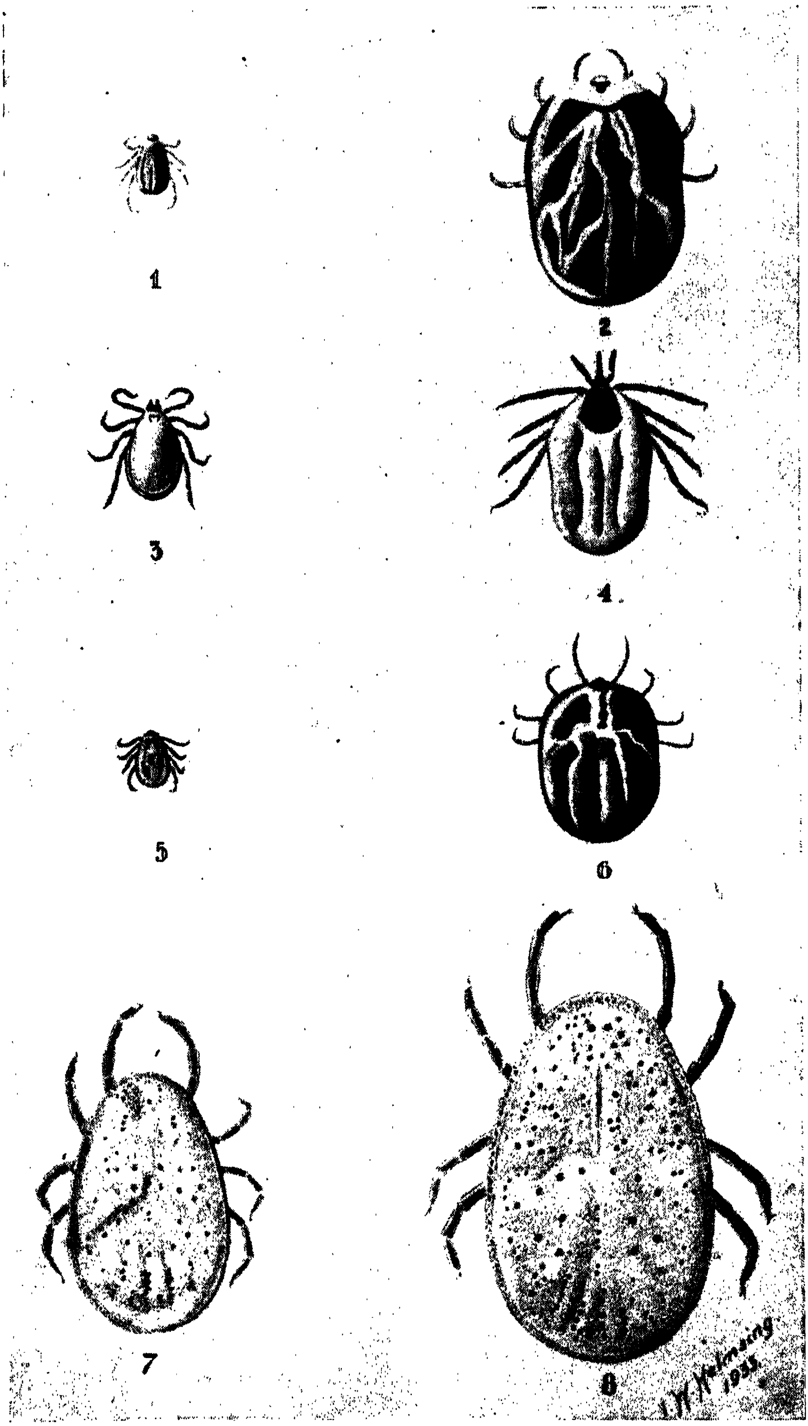


Plate 82.

It is not uncommon in the soil and among the debris under trees and in caves in Western Queensland and in the Gulf of Carpentaria. It is thought to be parasitic mainly on kangaroos, feeding on these marsupials when they rest under the trees, &c., where it occurs. However, it does not hesitate to attack man and dogs and would probably attempt to feed also on other domestic animals should the opportunity offer.

The bite is frequently followed by an intense local reaction in man, sometimes accompanied by temporary blindness, vomiting, and collapse. The effect on dogs is unknown.

The Scrub Tick (*Ixodes holocyclus*) (Plate 82; figs. 3 and 4).

The mouthparts of this tick are long and terminal, the palps being longer than the hypostome. There are no festoons and the anal groove encircles the anus in front, converging behind to meet at the edge of the body in the female (Plate 81; fig. 5), but remaining narrowly open in the male.

In Queensland, this tick is known as the scrub or bottle tick. In New South Wales, it is called the dog tick. The common dog tick in Queensland is *Rhipicephalus sanguineus*, which is rare in New South Wales.

The male is oval and yellowish, or yellowish-red in colour. The female is greyish with a yellow scutum. Fully engorged specimens may measure up to about three-quarters of an inch in length and are dark red, sometimes with a greenish tinge.

The scrub tick is found primarily in the moist scrubs of the coastal and sub-coastal areas, but has been recorded as far west as Warwick. Rain-forest country is a particularly suitable habitat.

The native hosts include various species of wallaby, kangaroo, opossum, bandicoot, native bear, pouched mouse, and the dingo. The bandicoot appears to be a favoured host. The scrub tick attacks man, all the domestic animals, and poultry.

Infestation of children and the domestic animals frequently gives rise to a condition of paralysis, which is usually fatal. Mortalities are especially noticeable among dogs, foals, calves, pigs, and sheep. During recent years reports have been received of deaths also among adult cattle, and in such instances a heavy infestation of ticks has been present.

The adults are most active during the spring and early summer, the period of greatest activity following the spring storms.

The Brown Dog Tick (*Rhipicephalus sanguineus*).
(Plate 83; figs. 3 and 4).

This tick, the female of which resembles the common cattle tick in size, may be recognized by its short mouthparts, the presence of eyes and festoons, a distinct anal groove encircling the anus behind, dark

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DESCRIPTION OF PLATE 82.

COMMON CATTLE TICK.—*Boophilus annulatus microplus.* Fig. 1: Male × 5. Fig. 2: Female × 5.

SCRUB TICK.—*Ixodes holocyclus.* Fig. 3: Male × 5. Fig. 4: Female × 5.

WALLABY TICK.—*Haemaphysalis bancrofti.* Fig. 5: Male × 5. Fig. 6: Female × 5.

POULTRY TICK.—*Argas persicus.* Fig. 7: Male × 7. Fig. 8: Female × 7.

brown legs, and deeply bifid first coxae (Plate 84; fig. 4 (*a*)). The male is very active and dark brown in colour. The female is greyish to dark red, depending on the state of engorgement.

It is widely distributed throughout the warmer regions of the world and is a very common tick on dogs everywhere in Queensland. It flourishes to such a degree in the western areas that cattle dogs and sheep dogs are seriously affected by the irritation caused by the gross infestations.

The dog tick is a domestic species, occurring only in the presence of dogs and in many instances has been associated with a serious infestation of dwellings. Under such circumstances, it rarely attempts to attack man and is a nuisance mainly because of its movements over the body. It has been recorded on a few occasions from cattle, sheep, horses, and cats, but is regarded as a rare parasite on these animals. This tick is a notorious vector of disease in many parts of the world and is capable of transmitting tick typhus and tulaemia to man, and anaplasmosis to cattle. It is a natural vector of biliary fever in dogs. Q fever of man, a type of tick typhus, is the only one of these diseases which occurs in Queensland. The fact that it is a three-host tick makes its control very difficult.

The Common Cattle Tick (*Boophilus annulatus microplus*) (Plate 82; figs. 1 and 2).

This is the most important of all ticks infesting domestic animals in Queensland. It is not only capable of causing considerable tick worry among cattle, but is also a vector of piroplasmosis, babesiellosis, and anaplasmosis, three types of tick fevers which are responsible for serious economic loss.

It is an introduced tick and occurs also in Asia, South Africa, the southern United States, Central and South America, and the West Indies. In Queensland, it is the common tick of cattle and horses. It will readily attack sheep and has also been taken from the pig, dog, deer, wallaby, and kangaroo. Deer (*Cervus elephas*) may be heavily infested and will prove a problem when the eradication of this tick is seriously attempted. It has been recorded only once on the pig, dog, wallaby, and kangaroo and it seems evident that these animals must be very unusual hosts.

Other ticks frequently found on cattle are the scrub tick, *Ixodes holocyclus*, the New Zealand cattle tick, *Haemaphysalis bispinosa*, the wallaby tick, *H. bancrofti*, and the ornate kangaroo tick, *Amblyomma triguttatum*. Adult *B. annulatus microplus* may be distinguished from these by the following characters.

(*a*) Mouthparts very short. The scrub tick and ornate kangaroo tick have long mouthparts.

(*b*) Legs usually very pale. In all other species, except the scrub tick, the legs are dark brown.

(*c*) Anal groove not present. This groove is conspicuous in the other species.

(*d*) Festoons are absent. These are present in all other species except the scrub tick.

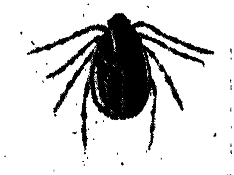
(*e*) Eyes are present. Eyes are absent in the scrub tick, the wallaby tick, and the New Zealand cattle tick.

(*f*) The scutum is uniformly brown. In the ornate kangaroo tick the scutum has coloured spots and areas.

(*g*) The body of the engorged and semi-engorged female is constricted behind the fourth pair of legs. This constriction is more noticeable when the tick is viewed from the ventral surface.

Under the system of cattle tick control in Queensland, it is frequently very important to be able to indicate how long any particular specimen has been attached. The following life cycle figures (supplied by Mr. L. F. Hitchcock, Officer in Charge, Cattle Tick Investigations, C.S.I.R.) will be of value in this respect: —

Size of Tick.	Minimum Age.	Maximum Age.	Average Age.
	Days.	Days.	Days.
Unengorged Larvae	3·5	8	4
Engorged Larvae	4·0	9	6
Unengorged Nymphs..	5·0	19	13
Engorged Nymphs	11·0	20	16
Unengorged Adults	13·5	21	18
Engorged Adults	18·5	35	23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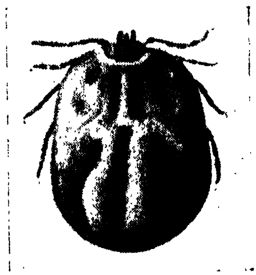
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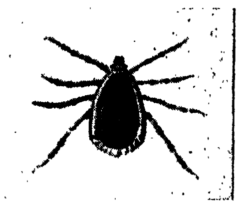
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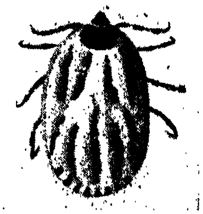
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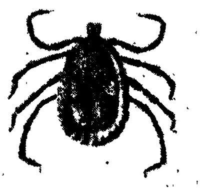
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Plate 83.

NEW ZEALAND CATTLE TICK.—*Haemaphysalis bispinosa.* Fig. 1: Unengorged female × 5. Fig. 2: Engorged female × 5.

DOG TICK.—*Rhipicephalus sanguineus.* Fig. 3: Male × 5. Fig. 4: Female × 5.

ORNATE KANGAROO TICK.—*Amblyomma triguttatum.* Fig. 5: Male × 5. Fig. 6: Female × 5.

The Wallaby Tick (*Haemaphysalis bancrofti*) (Plate 82; figs. 5 and 6).

In this tick the mouthparts are short; the palps strongly project laterally at their bases (Plate 84; fig. 1); eyes are absent; festoons are present: there is a distinct anal groove behind the anus; and the legs are brown.

The wallaby tick is by no means uncommon on cattle, but is seen only in small numbers. It is a native tick and has been collected from a number of marsupials, including the wallaby, the kangaroo, the rat-kangaroo, and the opossum. It will also attack man and has been seen on the dog.

The records show that this species is distributed widely throughout south-eastern Queensland and extends as far north as Townsville.

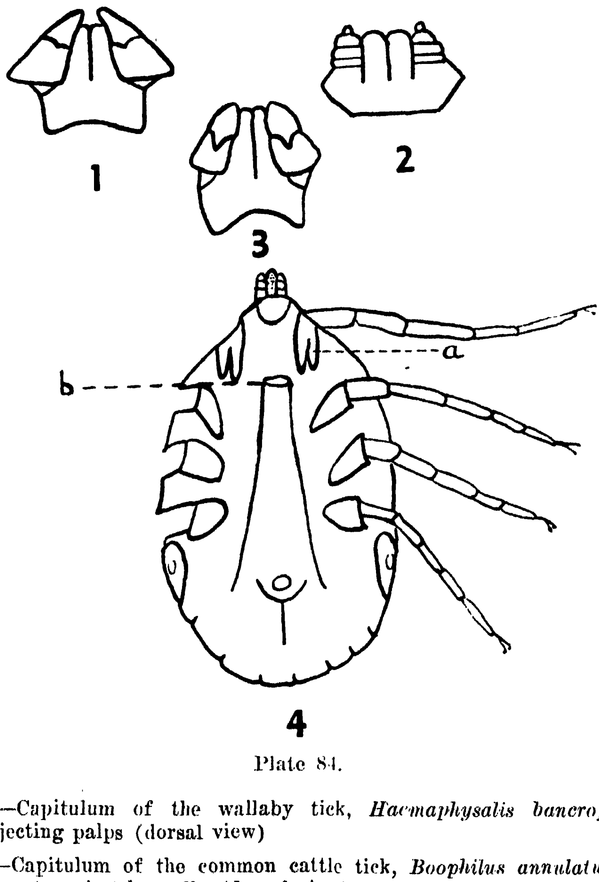


Plate 84.

Fig. 1.—Capitulum of the wallaby tick, *Haemaphysalis bancrofti*, showing laterally projecting palps (dorsal view)

Fig. 2.—Capitulum of the common cattle tick, *Boophilus annulatus microplus*. The palps do not project laterally (dorsal view).

Fig. 3.—Capitulum of the New Zealand cattle tick, *Haemaphysalis bispinosa*, showing laterally projecting palps and dorsal spine on third palpal segment (dorsal view).

Fig. 4.—Ventral view of the dog tick, *Rhipicephalus sanguineus*, showing (*a*) bifid first coxae; (*b*) genital opening.

The New Zealand Cattle Tick (*Haemaphysalis bispinosa*).
(Plate 83; figs. 1 and 2).

The mouthparts are short; the palps project laterally at their bases but not to the same degree as in the wallaby tick (Plate 84; fig. 3); there are no eyes; festoons are present; the anal groove is distinct and behind the anus; and the legs are brown. This species may be distinguished from the wallaby tick by the palps, which are not as salient at their bases and by the presence of a distinct and erect dorsal spine on the third segment.

It is an introduced species and occurs also in Asia, East Africa, and New Zealand. In the latter country it is very common on cattle and for this reason has been named the New Zealand cattle tick.

In Queensland, it is frequently seen on cattle in the south-eastern districts and heavy infestations may occur. It has also been taken on sheep, horses, and men.

The Ornate Kangaroo Tick (*Amblyomma triguttatum*).
(Plate 83; figs. 5 and 6).

The ornate kangaroo tick is so called because it is a common and widespread parasite of kangaroos in the State and is adorned with metallic whitish and greenish areas on the scutum of both male and female. The mouthparts are very long. The scutum of the female has a whitish spot at the posterior angle and sometimes whitish-green areas laterally. In the male, there are a pair of pale areas laterally and two small spots posteriorly. In some males, there is a broad pale median band, with extensive pale lateral markings. The eyes are very conspicuous. The anal groove is distinct behind the anus and festoons are present. The legs are dark brown, ringed with white at the joints.

It is an extremely common tick on cattle and has also been collected from sheep, horses, and dogs. Engorged females attain a very conspicuous size, and it is not unusual to see females almost an inch in length. Gross infestation of cattle is not recorded and, usually, one finds only a few ticks on any one beast. It is a native tick and has been taken from various species of kangaroos, wallabies, and the dingo.

TICKS OF RARE OCCURRENCE.

Occasionally ticks are found on domestic animals which are different from the species described above. These are of only very rare occurrence, however, and require expert examination for their identification. They include:—

1. The opossum tick, *Ixodes tasmani*, which infests the opossum, the native bear, and the native cat. It is recorded once from the horse.
2. The bandicoot tick, *Haemaphysalis humerosa,* a common parasite of the bandicoot, the opossum, and other native animals. It has been seen rarely on cattle and horses.
3. The snake and lizard ticks, *Amblyomma moreliae, Aponomma trachysauri,* and *Aponomma gervaisi,* and the echidna tick, *A. hydrosauri,* which on occasions may attack cattle and horses.

DIFFERENTIATING CHARACTERS OF TICKS COMMONLY FOUND ON DOMESTIC ANIMALS.

Species.	Common Name.	Mouthparts.	Anal Groove.	Festoons.	Eyes.	Palps.	Scutum.	Legs.	Domestic Animals Attacked.
Ixodes holocyclus	Scrub tick	*Long	In front of anus	Absent	Absent	Not projecting laterally	Uniformly yellowish	Yellowish	All domestic animals and poultry
Boophilus annulatus microplus	Cattle tick	Short	Absent	Absent	Present	Not projecting laterally	Uniformly brownish	Pale	Cattle, horse, and sheep; rarely dog and pig
Haemaphysalis bancrofti ..	Wallaby tick	Short	Behind anus	Present	Absent	Projecting laterally	Uniformly brownish	Dark	Cattle; rarely dog
Haemaphysalis bispinosa ..	N.Z. cattle tick	Short	Behind anus	Present	Absent	Projecting laterally	Uniformly brownish	Dark	Cattle, sheep, and horse
Rhipicephalus sanguineus ..	Dog tick	Short	Behind anus	Present	Present	Not projecting laterally	Uniformly brownish	Dark	Dog; rarely sheep, cattle, horse, and cat
Amblyomma triguttatum ..	Ornate kangaroo tick	Long	Behind anus	Present	Present	Not projecting laterally	With whitish-green areas	Dark with white rings	Cattle, sheep, horse, and dog

* In this tick the palps are longer than the hypostome.

Agricultural Chemistry

The Collection and Submission of Samples for Copper Analysis.

J. M. HARVEY, Chemist, Chemical Laboratory.

IT has been shown that the soils, and hence the pastures, of several areas of this State are deficient in copper. This has been noted in the field, confirmed by analysis and a response in affected stock obtained by administration of copper. A number of samples have been analysed in the Chemical Laboratory of the Department of Agriculture and Stock. In some cases contamination with copper, either in taking or in transport of the sample, has made the analysis of no value. It is felt, then, that some information on the care required in the collection and submission of these samples should be given.

The normal amount of copper in pasture and in the animal's body is small. The difference between adequate, doubtful, and deficient copper content, in the case of pasture, is in units per million. In the case of blood it is in the first decimal place of units per million. It is obvious, then, that any source of contamination must be eliminated. In the laboratory, all reagents are purified, all apparatus washed with acid and copper-free distilled water, and special care taken to avoid contamination by handling. These precautions are of no value unless contamination during collection and transport is avoided.

Pastures.

In New Zealand, it is claimed that the copper content is lower when grasses become mature and fibrous. This has not been established in this country, and it is considered advisable to collect samples at different stages of growth. The usual method is the clipping of a number of small areas about one foot square along a diagonal. The clippings are bulked and a sample taken from the bulk forms the sample from one field.

Care must be taken to avoid soil contamination both in a high rainfall area and from wind-blown dust in a dry area.

The most suitable containers for the samples are well-washed calico bags with a grease-paper bag lining.

Stainless steel scissors must be used for cutting of samples. The hands must be thoroughly washed.

Soils.

The collection of soil samples should be made with implements free from copper. A clean steel or iron spade or auger may be used. Samples should be submitted in well-washed calico bags.

Biological Material.

(i) *Liver.* The liver is the storehouse of copper in the body. A determination of the amount of copper in the liver is the most reliable means of establishing whether or not there is copper deficiency.

Wherever possible, the whole liver should be obtained and forwarded in acid-washed glass bottles without preservative. If the samples have to be sent from a long distance, pure redistilled formalin (40 per cent.) is used to preserve the organs. Only about 1 ounce of formalin is needed in a glass-topped Agee jar, which, of course, is suitably cleaned before use. Where the whole liver cannot be sent a section may be cut with stainless steel instruments.

(ii) *Blood.* The blood must be collected in all-glass syringes with stainless steel sockets. Those with plated brass sockets or plungers are useless and stainless steel ones must be made especially for this work. The blood is then transferred to pyrex tubes. These tubes are prepared by washing first with acid, then distilled water, and finally copper-free distilled water. The last should also be used to rinse the syringe between each bleeding.

FODDER CONSERVATION.

Silage making is a process whereby succulent green feed can be preserved with a minimum loss of digestible food material for quite lengthy periods of time or for as little as six weeks. Silage can be made successfully under weather conditions or from crops unsuitable for hay making. It could, if necessary be made even in light rain, while crops such as maize and sorghums, which are not suitable for hay making but yield a greater bulk of material per acre than the small grain cereals or legumes, can be used to advantage under conditions of good rainfall, or of irrigation.

Silage making increases the production possible from an area by allowing fodder to be stored when there is a surplus, against time of shortage—and also has the advantage that the product is not saleable, so that the fortunate possessor cannot dispose of it to his own ultimate disadvantage when good prices are offering for feed during drought periods. Silage is not subject to damage by fire or by mice, while generally speaking rain causes no damage to it, and provided reasonable care and attention to detail are given to the process, there is less risk of loss than in the case of hay making.

The product has a definite, though to a certain extent restricted place, in a fodder conservation programme, primarily as a drought feed in association with hay or stored grain and also as a supplement to the rations of milking stock (either dairy cows or calving stock) when the succulent pasturage required for milk production is short or only dry feed is available.

Hay has many good qualities as a conserved roughage. It has a low moisture content, and hence higher food value per ton of the final product, than silage. It has a resale value, can be handled with ease and nearly all stockowners are quite familiar with its handling and use as a feedstuff. Silage, on the other hand is not transportable and has not the wide usages of hay. It needs supplementing with hay or grain for feeding to stock and it is not a generally suitable food for horses, although up to 15 lb. per head may be fed. Its advantages as a foodstuff are its succulence and particularly, in the lower loss in food material when made under good conditions.

Silage making is, however, the only successful method of conserving the greenstuff of the heavy yielding summer cereal crops, maize and the sorghums. Because the crop is cut earlier than in the case of hay, the protein content is still high, allowing the preparation of a product high in this valuable food constituent. Provided the temperature is kept within the usual working limits the vitamin A content is preserved much more completely, which is a valuable consideration in the feeding of dairy stock.

MARKETING

General Notes for Month—March, 1947.

Market Prices Reports.

A MARKET Price Reporting Service has been inaugurated within the Marketing Division, and daily price reports for fruit and vegetables are now being supplied to the Press and the Broadcasting Services. This service will, from time to time, be extended to other primary produce.

Storage Silos for Peanut Crop.

The rapid expansion of the peanut industry during the past few years has necessitated the provision of additional storage space. The Queensland Peanut Growers' Co-operative Association Ltd. now has in hand the building of an additional 39 silos with a storage space of 8,500 tons. Nine of these are nearing completion, and it is hoped that they will be in operation for the harvest which has now commenced.

This will be the first additional storage built by the Board since 1938, when 24 silos were erected. This brought the total storage capacity up to 7,400 tons. Now that production has more than doubled as a result of the Australian demand, the provision of further storage facilities has become a matter of some urgency.

Production Trends.

Good rainfalls throughout dairying districts resulted in good growth of fodder crops and pastures. Dairy stock are in excellent condition, and a good winter production can be expected.

Fresh fruit and most vegetables will be in light supply during the current month.

On the Atherton Tableland, good conditions have enhanced the prospect of a 16,000 ton crop of maize from the 22,000 acres planted.

Grain sorghum crops are more promising and earlier estimates will be greatly increased.

Despite good rains, it is unlikely that the lag in sugar cane growth, caused by continuous dry weather, will be overtaken in many Northern mill areas. However, crops in the Southern areas have made an excellent recovery.

A yield of 20,000 tons is estimated for peanuts, harvesting of which has commenced in the South Burnett.

With the exception of the far inland areas, the pastoral industry is now assured of a secure feed supply during the winter months. Stock, generally, are in good condition.

TO SUBSCRIBERS.

Please renew your subscription without delay. Write your full name plainly, preferably in block letters.

Address your subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

GENERAL NOTES

Staff Changes and Appointments.

Mr. T. Douglas, Inspector of Stock, Division I., Goondiwindi, has been appointed District Inspector of Stock at Cloncurry. Mr. Douglas's successor at Goondiwindi will be Mr. L. G. Walker, Inspector, Division II., who has been appointed Inspector, Division I., Division of Animal Industry in the Department.

Farm Seed Standards.

Under new *Seeds Acts* regulations the prohibited seed list has been considerably reduced, but nevertheless contains Queensland's most objectionable weeds found in seeds for sowing, which now includes mint weed. The restricted weed schedule has been reduced to 18 species. The permitted quantity of weed seeds allowed by weight in crop seeds has been reduced. This applies also to inert matter. Germination standards in the main are unaltered.

North Queensland Citrus Sectional Group Committee.

Regulations under the *Fruit Marketing Organisation Acts* have been amended to provide additional representation for North Queensland on the Citrus Sectional Group Committee of the Committee of Direction of Fruit Marketing. The present northern electorate extends from Proserpine in the south to the Far North, and because of the difficulty experienced by the citrus delegate in contacting the associations comprising his electorate, action has been taken to divide the present electorate. Accordingly, the Cardwell, Mareeba, Dimbulah and Tully District Fruit and Vegetable Growers' Associations shall constitute the new electorate which shall elect one member, while the remaining groups of northern associations—namely, the Proserpine Fruit and Vegetable Growers' Association, The Charters Towers Primary Producers' Association, and The Banana Growers' Association at Jubilee Pocket—shall also elect a representative.

Honey Marketing Board.

An Order in Council has been issued under the *Primary Producers' Organisation and Marketing Acts* extending the operations of The Honey Marketing Board for a further period of three years from 9th March, 1947, to 8th March 1950. Members appointed for this period are Messrs. R. V. Woodrow (Woodford), R. R. Roff (Wynnum Central), H. E. Fagg (Killarney), O. N. Tanner (Mooloolaba), and H. S. Hunter (Director of Marketing).

Poultry Industry Regulations.

Regulations under *The Diseases in Poultry Acts*, 1923 to 1940, have been repealed, and new Regulations under *The Poultry Industry Act* of 1946 have been issued in lieu thereof. These Regulations cover the control of diseases in poultry, the registration of poultry stock suppliers, the slaughter of poultry for human consumption, and egg standards.

Veterinary Science Scholarships.

Following the institution of veterinary science scholarships to provide for the recruitment of future appointees to the veterinary staff of the Department of Agriculture and Stock, it has been announced that four scholarships have been allotted for 1947 to Messrs. A. A. Seawright (Townsville), D. H. Brown (Sherwood), R. R. Clem (Mayfield, via Camp Hill), and M. C. Riches (Greenslopes). The scholarships cover a period of five years, and the first two years of the course will be taken at the University of Queensland.

Cancelled Brand Fee.

An amendment of Regulations under the *Brands Acts* provides that the fee for re-registration of a cancelled horse or cattle three-piece brand shall be reduced from £3 to £1.

Wild Life Preservation.

An Order in Council has been issued under *The Fauna Protection Act* of 1937 declaring a sanctuary for the protection of fauna at Mt. Devlin Holding, near Hughenden, the property of Mr. H. H. Morell. Mr. Morell has been appointed an honorary protector for the sanctuary.

Rural Topics

Field Work of the Bureau of Sugar Experiment Stations.

While the volume of field investigational work of the Bureau of Sugar Experiment Stations was much below normal during the year 1945-46, the return of officers from national service enabled increased activity and an expanded programme of field trials now being put into operation.

A considerable proportion of the work of the Brisbane soils laboratory consisted in the analysis of soils for farmers who sought advice regarding the best use of their inadequate fertilizer supplies, and of soil samples collected in connection with district fertility surveys. The latter have been initiated in three districts and are yielding valuable results; they have aroused interest on the part of mill authorities and two mills sent chemists to the Brisbane laboratory during the last ''slack'' for tuition in soil sampling and analysis. It is evident that there has been a considerable decline in soil fertility levels, aggravated by the wartime shortage of fertilizer. Programmes initiated during the year include the State-wide establishment of approximately 100 liming trials to check the effect of the serious wartime shortage of this commodity, and the setting out of a number of ''minor element'' trials to check the adequacy of these soil constituents.

A soil conservation experiment was established on an area of relatively steep slope in the Childers district where the characteristic volcanic hills are showing the ill-effects of long-continued erosion of the soil.

A series of cultivation trials has been instituted in order to check the relative value of existing and modified field practices, including seed bed preparation. Good germination is of primary importance in cane culture and a well-prepared seed bed is essential in the drier areas of the cane belt. The value of preplanting treatment of cane setts, by dipping in fungicides, is also being investigated by the pathologists, with encouraging results.

Shortage of field labour has helped to stimulate interest in improved mechanical equipment and several new or modified implements are briefly described in the account of the work of the field staff.

Use of the standard form of variety trial necessarily restricts the number of farms on which such trials can be placed, with the result that variation in local conditions has often been insufficient to give a true assessment of a variety in a limited time. In an attempt to meet this difficulty there has now been adopted a trial system of planting dispersed trials in which a Latin square or randomised block is distributed over a number of farms of the same general soil type.

Cane Breeding Programme.—The cane breeding programme, which had been resumed on a full basis, suffered a severe check by drought. A considerable change has been effected in the varietal composition of the cane crop. Badila remains the major variety, but the position of the next two varieties (P.O.J.2878 and Co.290) is now being challenged by the rapid increase of the Macknade and Mackay seedlings, Trojan and Q.28. Trojan, bred in 1933, comprised 8.2 per cent. (372,000 tons) of the 1945 crop and is being further planted in northern areas. Q.28 was bred in 1935 and last year contributed 293,000 tons, or 6.4 of the crop; it is expected that between 600,000 and 700,000 tons of this variety will be harvested in the Mackay district this season, while it is being extended in southern mill areas.

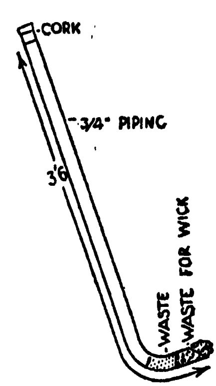
Some new local seedlings are now begining to find favour and will increase the lead established in 1941 when Queensland-raised varieties moved to first place on the basis of country of origin. New Guinea, which held pride of place for so long, is again in second place, with 27.1 per cent., compared with Queensland's 35.1 per cent.

—*Extracted from the 46th Annual Report of the Bureau of Sugar Experiment*

GADGETS AND WRINKLES

A HANDY TORCH FOR SCRUB BURNING.

The idea illustrated here representing a handy torch for scrub burning has been successfully used by one ingenious farmer and some such implement (or a number of them) might be well worth having by some who may be in districts where such a thing is often needed.



It consists of a piece of pipe of convenient length, bent around at the end as shown (somewhat the shape of a hockey stick).

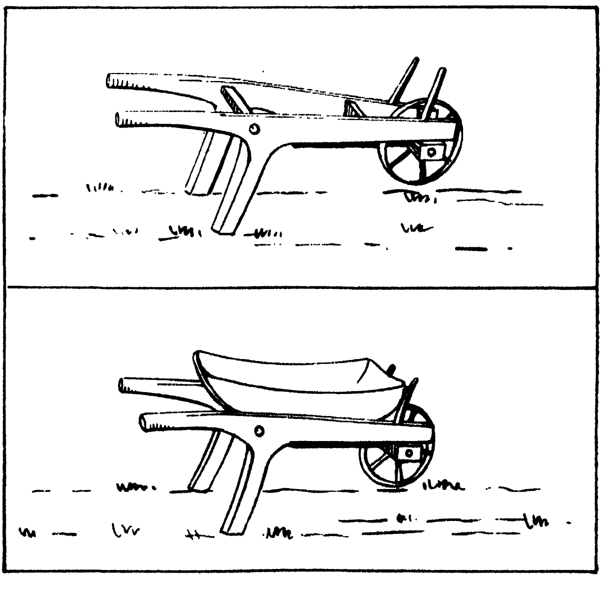
One end is plugged with old rag or cotton waste tightly enough to prevent oil soaking through in excessive quantities; a second piece at the end being left somewhat looser to act as a wick.

The top end is closed with a cork. The length of pipe is then filled with the kerosene, or with any waste oil that will soak through the wick and burn easily.

It is more convenient to use than the usual method of trailing around burning branches, and can be used for the rapid burning of firebreaks during bushfire weather.

A BUSH WHEELBARROW.

Select a forked branch of suitable size and shape and saw it down the centre, and so provide two sides of a wheelbarrow "chassis." Trim the hand grips and bore two auger holes for the cross pieces, which are wedged in position as when fitting a hammer handle. Two long bolts pass from side to side make the frame firm and solid. Two blocks of wood are bolted on to take the axle, and a bitumen drum section forms the body of the barrow.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

HOW MUCH DO YOU SPEND ON FOOD?

THE working out of a family or personal budget is a top topic these days, and is interesting to note that some people seem to be able to live much more economically than others. *However, the part of family budgetting that we are most concerned with is not exactly how much is spent but which items receive priority in the budget.*

Because the body is built up of the food we eat; and also because not only the height and weight, but also the health of our bodies is largely dependent on our food, this must be our first consideration. Pretty clothes and entertainments lose their charm if one does not feel well, and no amount of cosmetics will compensate for poor physique, dull eyes and hair and a muddy or blotched complexion.

Therefore, by far the largest proportion of the family income should be spent on food and to protect the family health at least one third of the income should be set aside for that purpose. If skimping has to be done it should be done among the less important items. First lay out so much money for food and then divide the remainder amongst the other things.

We realize that this is not always easy when rents are high and the cost of clothing materials almost prohibitive, but one slogan mothers and fathers should keep in front of their minds always is "it is ever so much cheaper to be well." Without the right food it is impossible to be really well.

Diet for children and the rest of the family should be planned as carefully as an architect plans a building, because the parent is the architect of the children's future and foods are the building materials.

A well-nourished child is not only the right weight for his age, but also has strong straight bones, sound teeth, good colour, firm flesh, good digestion and a clear mind. He is full of "pep," and fun and does not easily get "catching" diseases.

It is no use giving children a good education unless they are well, because otherwise they lose a great deal of its benefit.

A child who is always ailing loses ground at school, he cannot take the same interest, his mind does not work so quickly and so his future as a wage earner as well as a good and happy citizen may be affected.

Check the family budget and see how much is being spent on food. Next month we shall talk about the kinds of foods that are wholesome and nourishing, and see how they can be bought out of even a small income in spite of the high prices of some items.

Any further information on this or any other matter concerning Maternal and Child Welfare may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters *Baby Clinic, Brisbane*. These letters need not be stamped.

IN THE FARM KITCHEN.

Fruit and Vegetable Salads.

Nutrition experts maintain that at least one fresh, raw vegetable should be included in the diet each day to supply certain minerals and vitamins necessary for health. In view of this, salads should be part of the daily menu throughout the year, and not confined to the summer months as is often the case.

Salads lend themselves most suitably for luncheon dishes, and when served as a main course may include cheese, hard cooked egg, cold meat or fish. Lettuce leaves usually form the foundation of a salad, although cabbage, cress, or tender inside leaves of spinach may be substituted. Other uncooked vegetables suitable for use are tomatoes, celery, cucumber, carrots (usually grated), thinly sliced onion and spring onions.

Many cooked vegetables may be used in combination with others to add variety in flavour and colour and to make the salad more substantial. Beetroot, peas, carrots, cauliflower, potatoes and asparagus are suitable. The fruits most commonly used in mixed salads are oranges, grapefruit, bananas, apples, pears, pineapples, and avocados.

Parsley, mint and chives are suitable for garnishing and for added flavour.

Fruit and Vegetable Combinations.

Following are some suggested combinations for fruit and vegetable salads. These should be arranged on lettuce, garnished and served with mayonnaise.

1. Sliced avocado with grapefruit and orange sections.
2. Sliced pineapple with cream cheese.
3. Diced cooked carrots, potatoes and peas mixed with salad dressing and served in tomato cases.
4. Halved pears spread with cream cheese and sprinkled with chopped nuts.
5. Apple rings topped with chopped celery which has been moistened with mayonnaise.
6. Grated carrot, chopped celery and spring onions mixed with mayonnaise and served with sliced tomatoes.

Points in Salad Preparation.

The following points are of importance when preparing salads:—

1. Salad greens must be fresh, crisp and thoroughly washed.
2. Best results are obtained from chilled vegetables and fruit.
3. A stainless knife should be used for cutting, to prevent discolouration.
4. If using cabbage with, or in place of lettuce, choose one that is young and mild in flavour.

A well flavoured dressing or mayonnaise should be served, although some prefer just vinegar or lemon juice.

Moulded Salads.

Moulded or jellied salads are decorative and colourful and if well arranged and garnished can lend quite a festive air to an otherwise simple meal. Vegetables such as tomatoes, peas, asparagus, beetroot and carrots and almost any of the fruits are suitable for moulding in a savoury jelly. They can be arranged in quite attractive patterns on the bottom of the mould by first setting in a thin layer of the prepared jelly and then adding the remainder of the ingredients. Jellied tomato puree or juice is very popular because of its colour, flavour, and food value.

Always unmould the salad on a dish sufficiently large to allow room for garnishing.—June Chancellor in *The New South Wales Agricultural Gazette.*

QUEENSLAND WEATHER IN MARCH.

Rainfall distribution throughout the greater part of the State was not only well above average but most opportune, particularly during the latter half of the month when a critical pastoral situation was amply relieved in many Carpentaria districts and supplementary falls in the South-West consolidated the good relief rains of February, while further heavy to flood rains extended over the greater part of the south-east quarter. Far South-West streams reached reporting levels but were not in the category providing sufficient run-off from higher catchments to give an extensive soaking outside the main channels. Throughout most of the rest of the State, most rivers and streams were either flowing strongly or in flood presenting the not unusual seasonal factor of valuable surplus water running to waste. Aggregate district storms in the Peninsula were just short of normal and the North Coast Barron was 21 per cent. below. A slight deficiency was experienced in parts of the Central Highlands. The Central Lowlands and Lower West Divisions with aggregates of 1¾ in. and 1 in. were respectively 27 per cent. and 38 per cent. below normal. Although sections of these districts received 3 to 5 in. falls in February, other parts recorded only patchy benefit. The same Central Interior areas missed the otherwise almost general March rains, and early falls are required to ensure winter and spring pastures. Over most of the pastoral areas of the State, however, reasonably good to very good wintering conditions should be now realized and since February recovery and bountiful to flood falls have spread over all south-eastern and coastal pastoral, dairying and farming areas. Some heavy monthly totals included:—Burketown 3,151 points (record), Normanton 2,284, Mt. Surprise 929, Atherton 1,089, Innisfail 3,231, Giru 2,521, Rolleston 836, Duchess 633, Bulgroo 315, Calliope 1,667, Childers 1,666 (several Port Curtis districts 10 to 15 inches), Springbrook 3,038, (many Moreton districts 10 to over 20 inches), Chinchilla 1,075 (many eastern Downs districts 4 to 8 inches), Talwood 757, St. George 617, Dirranbandi 317, and a number over two inches in the Far South-West.

Floods.—There were flood rises in all streams from the Fitzroy River to Southern Border Divisions, both coastal and inland, on the first of the month, and run-off was maintained along the Mary and Burnett until the 3rd with rises continuing to pass down the Balonne and MacIntyre. On 6th and 7th, the Fitzroy and other streams in south-west divisions were again swollen until conditions eased by the 10th. At the end of the month there was a heavy rain run-off along the MacIntyre and Condamine and streams in the South Moreton districts with also moderate freshes in Fitzroy and Burdekin; flood waters were temporarily over the Inkerman Bridge on the 31st.

Temperatures.—Maximum temperatures ranged from 1.3 deg. above normal at Georgetown to 2.8 deg. below at Thargomindah, relatively cool conditions. Minimum readings were somewhat above normal except at Thargomindah 1.7 deg. below. Highest maximum 106 deg. (7th) at Urandangie where over 100 deg. was recorded on 14 days. Richmond had 16 days above 100 deg.

Brisbane.—Mean pressure $\frac{9 + 3}{2}$ 29.967 inches (normal 29.965). Temperatures.—Mean maximum, 81.2 deg. (normal 82.2); mean minimum, 68.0 deg. (normal 66.4 deg.); mean temperature, 74.6 deg. (normal 74.3 deg.). Highest daily, 88.6 deg. on 18th (lowest since 88 deg. 2nd March, 1936); lowest daily, 62.8 deg. (22nd). Rainfall.—1,124 points on 19 days (average 565 on 15 days); Brisbane rainfall for three months January-March 3,292 points, highest since 1931 (3,955 points).

The rainfall position is summarised below—

Division.	Normal Mean.	Mean March. 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	1,219	1,186	3 below
Peninsula South	687	639	7 „
Lower Carpentaria	398	1,149	19 above
Upper Carpentaria	344	749	118 „
North Coast Barron	1,379	1,091	21 below
North Coast Herbert	1,390	1,916	38 above
Central Coast East	603	792	31 „
Central Coast West	345	352	2 „
Central Highlands	279	266	5 below
Central Lowlands	239	174	27 „
Upper Western	197	219	11 above
Lower Western	161	100	38 below
South Coast Port Curtis	427	875	105 above
South Coast, Moreton	637	1,054	65 „
Darling Downs, East	277	576	108 „
Darling Downs, West	232	397	71 „
Maranoa	263	385	46 „
Warrego	193	213	10 „
Far South-West	133	239	80 „

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

MAY, 1947.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.13	5.17	Cairns	12	46	Longreach	28	42
6	6.16	5.13	Charleville	26	28	Quilpie	37	33
11	6.19	5.09	Cloncurry	38	61	Rockhampton ..	2	18
16	6.21	5.06	Cunnamulla ..	31	28	Roma	15	18
21	6.24	5.04	Dirranbandi ..	21	17	Townsville	11	38
26	6.27	5.02	Emerald	13	26	Winton	31	50
31	6.29	5.00	Hughenden ..	23	47	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	3.10	2.05
2	3 42	3.05
3	4.14	4.03
4	4.47	5.00
5	5.21	5.56
6	5.56	6.54
7	6.35	7.51
8	7.19	8.47
9	8.06	9.42
10	8.57	10.33
11	9.50	11.21
		p.m.
12	10.45	12.04
13	11.41	12.43
14	..	1.19
	a.m.	
15	12.38	1.53
16	1.34	2.25
17	2.32	2.57
18	3.31	3.31
19	4.34	4.08
20	5.39	4.49
21	6.48	5.37
22	7.59	6.32
23	9.08	7.34
24	10.11	8.41
25	11.07	9.49
26	11.55	10.56
	p m.	
27	12.36	11.59
28	1.13	..
		a.m.
29	1.46	12.59
30	2.18	1.57
31	2.49	2.54

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19:
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	16	23	31	39	7	14	36	45
6	26	13	43	28	18	3	50	32
11	29	10	45	25	20	0	52	28
16	22	17	38	33	13	8	44	37
21	12	28	27	43	2	19	30	52
26	12	26	27	42	2	17	30	49
31	22	17	38	33	13	8	44	37

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	22	38	45	57	30	42	19	33
3	33	28	52	49	37	34	27	24
5	43	17	59	42	44	27	36	16
7	51	9	65	36	49	22	42	9
9	54	4	67	33	51	19	44	5
11	53	5	67	34	50	20	44	6
13	45	10	61	37	46	23	37	10
15	42	19	58	43	43	28	35	17
17	31	30	51	50	35	35	25	25
19	20	40	44	58	29	43	18	34
21	10	50	37	63	22	49	9	42
23	5	52	35	65	19	50	5	44
25	7	49	36	63	20	49	7	41
27	16	39	41	57	26	42	14	34
29	27	35	48	55	33	40	22	30
31	36	24	55	46	40	32	30	21

Phases of the Moon.—Full Moon, May 5th, 2.53 p.m.; Last Quarter, May 13th, 6.8 p.m.; New Moon, May 20th, 11.44 p.m.; First Quarter, May 27th, 2.35 p.m.

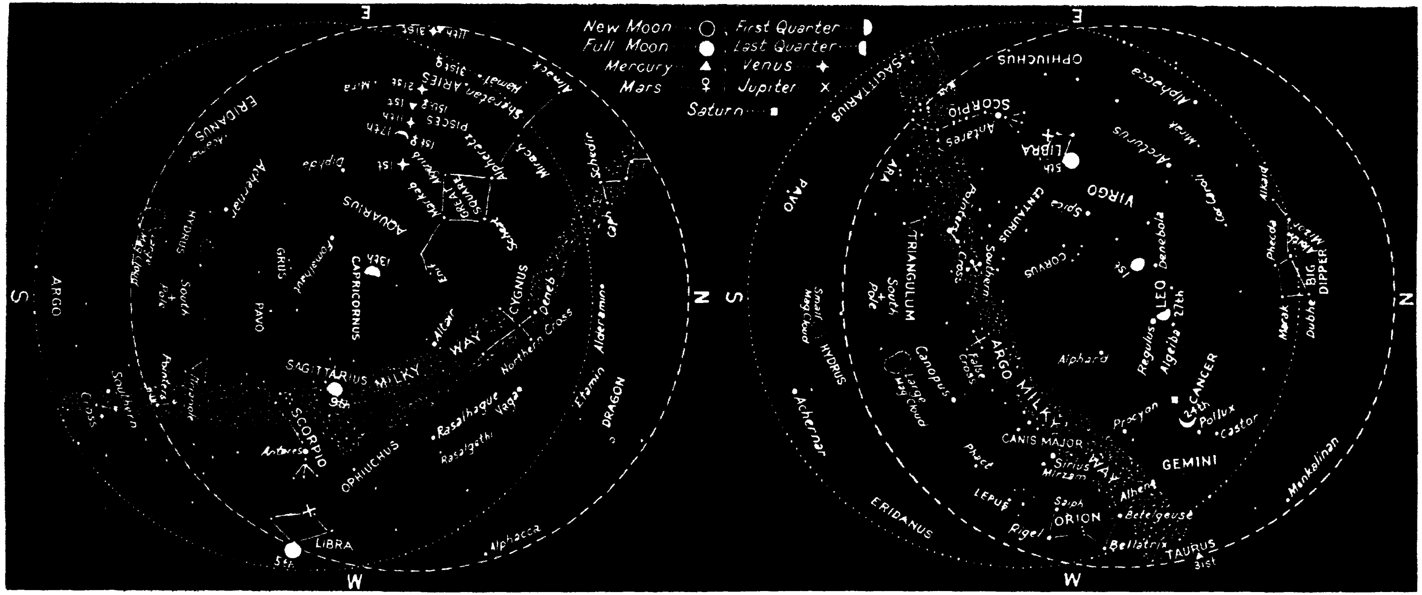
On May 17th the Sun rises and sets 20 deg. north of true east and true west respectively, and on May 2nd and 17th the moon will rise and set approximately at true east and true west respectively.

Total Eclipse of Sun, May 20th.—The path of totality—about 100 miles wide—will stretch from about 200 miles to the west of Concepcion, in Chile; across South America to Bahia, in Brazil; across the Atlantic Ocean to Liberia, in Africa; across the centre of Africa to just east of Lake Victoria. It will be seen from all Africa and nearly all South America as a partial eclipse.

Mercury.—On the 1st in the constellation of Pisces will be a morning object, rising about 1 hour 15 minutes before the Sun. The interval of its rising before sunrise will decrease until the 15th, when it will be in superior conjunction and will rise and set with the Sun. After this date it will become an evening object and on the 27th will pass between Aldebaran and Nath. On the 31st, in the constellation of Taurus it will set about 1 hour after the Sun.

Venus.—Now observable low in the east during morning twilight. At the beginning of the month in the constellation of Pisces, will rise about 2½ hours before the Sun. On the 17th it will pass 1 degree to the south of Mars. At the end of the month, in the constellation of Aries, it will rise at about 2 hours before sunrise.

Mars.—At the beginning of the month, may be seen between Mercury and Venus when it will rise about 2 hours before the Sun. At the end of the month, in the constellation of Aries, it will rise nearly 2½ hours before the Sun.



Jupiter.—Will rise near sunset at the beginning of May and will be visible throughout the night. At the end of the month, it will rise during the afternoon and will set about 1 hour 15 minutes before sunrise.

Saturn.—Now rises before midday and will be well up in the heavens by evening. On the 1st it will set about 1 hour before midnight and on the 31st between 9 p.m. and 10 p.m.

Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th May. (For every degree of Longitude we go west, time increases 4 minutes). The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing North hold "N" at the bottom; when facing South hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the moon and planets which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MARCH RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of years' re-cords.	Mar., 1946.	Mar., 1947.
North Coast.	In.		In.	In.
Atherton	9·08	42	10·61	10·89
Cairns	18·16	61	7·37	15·67
Cardwell	15·77	71	19·73	21·98
Cooktown	15·28	67	4·14	12·78
Herberton	7·93	57	8·58	4·31
Ingham	15·99	51	20·17	25·73
Innisfail	26·81	62	20·13	32·47
Mossman	18·75	19	4·91	16·44
Townsville	7·11	72	16·78	11·59
Central Coast.				
Ayr	6·37	56	13·15	19·11
Bowen	5·74	72	13·66	8.51
Charters Towers	3·71	61	7·35	3·89
Mackay	12·09	72	19·36	5·47
Proserpine	12·17	40	16·73	10·90
St. Lawrence	5·41	72	7·09	5·55
South Coast.				
Biggenden	3·98	44	2·31	11·47
Bundaberg	5·35	60	4·82	9·10
Brisbane Bureau	5·65	95	8·34	11·24
Caboolture	7·83	67	15·16	14·62
Childers	4·84	48	3·80	16·66
Crohamhurst	11·12	50	21·99	..
Esk	4·72	56	6·43	6·51
South Coast—contd.	In.		In.	In.
Gatton College	3·33	44	4·21	4·98
Gayndah	3·10	72	0·99	9·56
Gympie	6·13	73	7·83	9·21
Kilkivan	3·90	62	3·39	9·57
Maryborough	5·90	72	7·30	9·39
Nambour	9·41	47	22·11	21·17
Nanango	3·42	61	4·30	6·56
Rockhampton	4·48	72	4·40	5·76
Woodford	7·90	55	15·81	9·89
Darling Downs.				
Dalby	2·74	73	1·04	5·15
Emu Vale	2·47	47	3·27	3·83
Jimbour	2·43	64	0·89	7·15
Miles	2·74	58	0·32	3·53
Stanthorpe	2 59	70	2·58	6·08
Toowoomba	3·78	71	4·38	8·44
Warwick	2·60	78	3·61	3·36
Maranoa.				
Roma	2·72	69	Nil	1·93
St. George	2·15	62	0·68	6·17
Central Highlands.				
Clermont	3·16	72	4·55	1·91
Springsure	2·97	74	2·27	2·81

CLIMATOLOGICAL DATA FOR MARCH.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	88	74	94	4	69	26	1,565	22
Herberton	..	80	65	86	30	59	15	431	18
Townsville	..	87	74	92	31	69	28	1,159	17
Rockhampton	29·93	85	70	92	2	65	23. 25	576	16
Brisbane	30·00	81	68	89	18	63	22	1,124	19
Darling Downs.									
Dalby	..	84	64	91	18	55	22, 24	515	9
Stanthorpe	..	77	59	85	5, 18	50	24, 25	608	18
Toowoomba	..	77	61	86	18	53	22	844	14
Mid-Interior.									
Georgetown	29·83	92	72	98	2, 9, 17	67	27	760	12
Longreach	29·87	88	73	95	5, 8, 9, 15, 16	67	31	168	8
Mitchell	29·95	85	63	89	9, 10, 16	51	24, 25	284	8
Western.									
Burketown	..	89	76	98	3	71	28	3,151	15
Boulia	29·81	96	75	106	2, 8	65	31	90	5
Thargomindah	29·88	88	66	100	9	60	3	216	5

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,

Meteorological Bureau, Brisbane.

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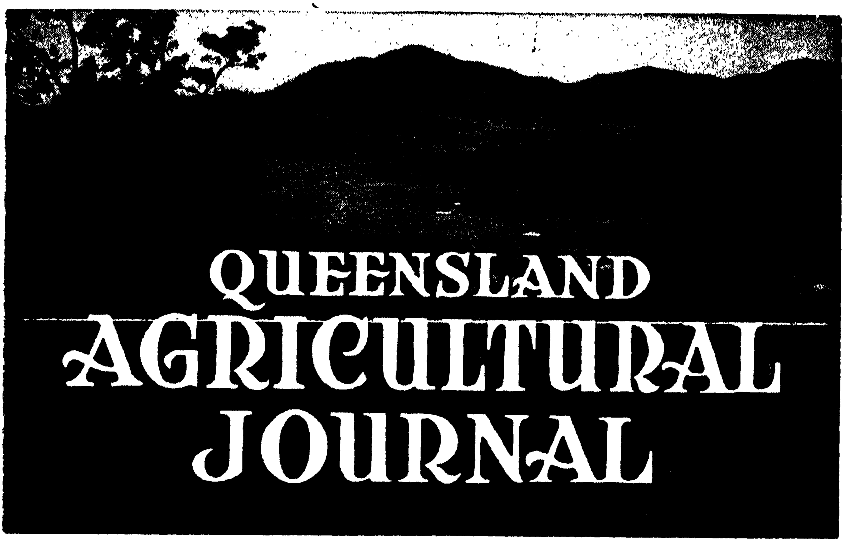


Volume 64 | 1 MAY, 1947 | Part 5

Event and Comment.

Food for Britain.

DURING the war, Britain's enemies did their worst to starve her out, but she met the challenge by doubling her pre-war production. Behind that simple fact is the story of a great endeavour, of an extraordinary gift for improvisation and of commonsense co-operation among food producers and skilled administrators inspired by a lively practical patriotism. Remarkable success in the handling of wartime food production was a natural corollary. In the biggest crisis of her history Britain was able to rise to the emergency and work out a plan which saved her people from hunger, although it was done on a strictly rationed diet. Within the scope of that plan came, of course, food supplies from the Dominions.

During the six long years of blitz, blackout, blast, and blockade, the people of Britain lived on a skimpy dietary scale, restricted both in quantity and variety. All that time they had to do with less than the lowest amount of rationed food that any other English-speaking community had been called upon to accept. On top of that, to feed her famine-stricken neighbours Britain, with characteristic generosity, drew on her own security food reserves, so soon to become a diminishing quantity and which had been accumulated by foresight, prudent management, and self denial.

For over two years Britain, aided by the Dominions, fought the greatest war in history alone; and while the war lasted the whole of

her population was virtually in the front line. It cost her hundreds of thousands of lives, thousands of millions in money, the destruction of or damage to 4,000,000 homes, the ruin of innumerable factories, and great havoc to her other industries.

At the end Britain was financially exhausted, but not in spirit. She is now fighting her way back to recovery gradually by self-sacrifice and toil, beset by tremendous difficulties. A wet autumn, a succession of winter blizzards followed by disastrous flooding of millions of acres of her best farming lands have made her food position more precarious than ever. The loss of crops and livestock at this stage is a shattering blow to a people who, even had their last harvest been normal, would still have to continue on their monotonous meals based on a scanty scale of rationing. Entitled when victory came to look forward to fuller meals and some luxuries, they are now existing on even shorter commons than they had to take during the blackest war period.

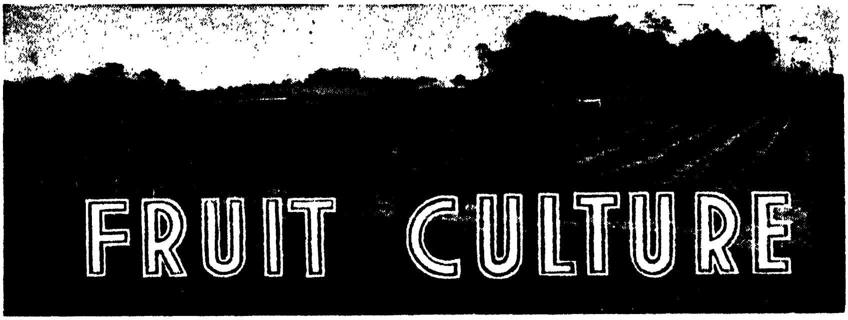
Britain's hope is in the capacity and courage of her people. Of their possession of those qualities and, above all, of an unconquerable spirit there, happily, can be no doubt. With sleeves rolled up they are already on the job of all-out production, with consequent long hours of unceasing strain on brawn and brain; but to keep going for any length of time they must be properly nourished. Large supplies of nutritious food are needed for their sustenance so that increased production in all industries, so essential to complete economic recovery, may be achieved.

When Britain fought alone she used her accumulated savings of a century, a vast amount which vanished during the dark days of 1940-42. In the later years of war, with all her credits gone astronomical debits piled up and when V-Day dawned she did not have a penny in her purse. Huge loans had to be raised and with their credits Britain has been able to buy wheat, meat, and other essential foods, as well as the new factory equipment required for the rebuilding of her industries. Despite the hard times through which she is passing, Britain is determined to recover and keep her place as a leader in world affairs.

Australia and the other Dominions of the British Commonwealth are rallying to the assistance of the Mother Country. Throughout this continent there is a definite desire to help in such a way that the people of Britain may not be called upon to make further sacrifice. It is recognized that the need is theirs, the obligation ours, and the call to honour it is immediate.

Britain wants our wheat, meat, butter, cheese and other necessities to help her through. Every extra ton will be welcomed. Food and more food must be sent quickly. Contributions made through various Food for Britain appeals have aided in relieving the position, but a much greater effort is needed now to increase our shipments of essential commodities.

It is expected, therefore, that exports to Britain will rapidly increase and will be promptly despatched; and that private organizations and individuals who can, from their abundance, send food will redouble their endeavours.



A Grape Variety Trial at Charters Towers.

S. E. STEPHENS, Horticulturist, and F. L. JARDINE, Adviser in Horticulture.

THE Charters Towers district, the chief grape-growing area of tropical Queensland, is situated 80 miles inland in a direct line from the coast at an elevation of 1,000 feet above sea level. Weather conditions are hot and dry in the early summer with a short wet season in January and February, and frosts occur each winter. The average annual rainfall is 24½ inches.

Land under horticultural crops is largely alluvial flats and pockets along the tributaries of the Burdekin River. The soil is of sandy loam to loam. Cultivation also extends to the lower slopes of the adjacent rises, where the soil is reddish brown, with gravelly texture and fair clay content. All crops are grown under irrigation.

Grape production in the area has been built up round the Royal Ascot variety, which thrives and crops well, is hardy, and matures its crop sufficiently early to escape the wet weather except when the wet season occurs abnormally early. The variety is not a first-class commercial one, however, and it was considered that if an expansion in the grape industry was to take place it should be based on better varieties than the Ascot. In an endeavour to find other varieties suitable to the conditions obtaining in the district a trial was laid down in July, 1940.

The soil selected for the trial was of the red-brown gravelly type on a low slope bordering an alluvial flat. The soil analysis, as supplied by the Agricultural Chemist, indicated that available nitrogen and phosphate were very low but potash fair; the soil was alkaline in reaction.

The land was prepared according to the usual method followed by the grower; that is, the rows were trenched and broken up to a depth of 15-18 inches, and then thoroughly irrigated during the week before planting.

Varieties.

The following 13 varieties were selected for trial:—Belas Blanco, Black Malaga, Black Prince, Chaouch, Doradillo, Gros Colman, Henab Turki, Ohanez, Purple Cornichon. Red Malaga, Servant, Waltham Cross, and White Wax. The vines were secured from Stanthorpe as rooted cuttings. Six plants of each variety were included in the plot, which was planted in July, 1940. Plants were set six feet apart in the rows and the rows were 10 feet apart, so that the plot occupied an area of approximately one-ninth of an acre.

Training Method.

Waltham Cross and Purple Cornichon were trained on the Bordelaise espalier system and all other varieties on the unilateral cordon system. In addition to the regular winter pruning, a moderate amount of summer pruning was given where necessary to keep the vines within reasonable bounds.

Fertilizer Treatment.

An initial fertilizer dressing of ½ lb. per vine was applied, after the vines had become established in February, 1941, a complete mixture of 8:8:8 formula being used. Subsequent treatments of 1 lb. of the same mixture per vine were given in early spring of each year, except 1942. In that year the treatment was 1½ lb. of dried blood and meatworks mixture (7% N., 10% P_2O_5) in August, followed by ½ lb. sulphate of ammonia in September and again in November.

Observations.

Observations on habit, yield, disease resistance and so on are summarised in the accompanying table.

Variety.	Yields in Pounds.					Remarks.
	1942-3.	1943-4.	1944-5.	1945-6.	Average per vine.	
Belas Blanco (6 vines) ..	16	10½	9	6	1¾	Weak-moderate habit; foliage sparse; leaves suffer from marginal scorch; fruit affected by sunscald; fruit poor quality. Generally unsatisfactory.
Black Malaga (6 vines) ..	..	..	..	..	..	Weak habit; subject to black spot; no crop set. Generally unsatisfactory.
Black Prince (6 vines) ..	2½	3	17	3	1	Moderate habit; fairly resistant to black spot; unfruitful with spur pruning but improving with long pruning; fruit ripens in latter half of December.
Chaouch .. (5 vines) ..	..	25*	40*	64*	5½	Vigorous habit; very early variety; crops well if short pruned; high resistance to black spot; bitter rot destroys most of the fruit each season. Unsatisfactory.
Doradillo (6 vines) ..	..	..	..	..	..	Very weak habit; subject to black spot. Generally unsatisfactory, but some doubt as to variety.
Gros Colman (6 vines) ..	16½	22*	44*	35* (5 vines)	5¼	Very vigorous habit; sturdy variety and good cropper; resistant to black spot; fruit ripens unevenly; half crop lost by bird attack. Unsatisfactory.
Henab Turki (5 vines) ..	19½	14*	4	8 (4 vines)	2¼	Moderate habit; subject to black spot and marginal leaf scorch; should be more fruitful with long pruning; crops in December-January.

* Estimated yield if no loss from bitter rot and birds had occurred.

Variety.	Yields in Pounds.					Remarks.
	1942–3.	1943–4.	1944–5.	1945–6.	Average per vine.	
Ohanez .. .. (6 vines)	15	20*	26*	**	2½	Moderate habit; subject to black spot and bird attack; good carrying variety; crops best when long pruned; late ripening. A promising variety.
Purple Cornichon	7	**	4	..	½	Weak habit; sparse foliage; fruit subject to sunscald. Generally unsatisfactory.
Red Malaga .. (4 vines)	1½	..	..	.. (3 vines)	⅛	Weak-moderate habit; small bunches; poor fruit. Generally unsatisfactory.
Servant .. .. (6 vines)	39	68*	84	50* (4 vines)	11½	Vigorous habit; subject to bird attack; late ripening; fruiting excellent. Most satisfactory variety in trial.
Waltham Cross.. (5 vines)	9½	5½	2	..	¾	Weak habit ; poor bunches. Generally unsatisfactory.
White Wax .. (5 vines)	11	8½	18	21	3	Vigorous habit; early variety; subject to black spot; crops best when long pruned. A promising variety.

	1941	1942	1943	1944	1945	Average.
Royal Ascot in vineyard ..	12	14	11	11	12	12

* Estimated yield if no loss from bitter rot and birds had occurred.

** Crop totally destroyed by birds.

Summary.

Of the 13 *Vitis vinifera* varieties selected for trial in the Charters Towers district, only three varieties show promise as to vigour and cropping habits. These are Servant, White Wax and Ohanez in that order. Probably the last two would improve in cropping with long pruning.

It will be noted from the remarks concerning the behaviour of each variety that the following six varieties are totally unsuitable:—

Belas Blanco, Black Malaga, Doradillo, Purple Cornichon, Red Malaga, and Waltham Cross.

The damage caused by birds and bitter rot* has been so extensive that Gros Colman and Chaouch, which made good growth and cropped reasonably well, cannot be regarded as satisfactory varieties until the trouble in each case can be overcome.

Black Prince and Henab Turki did not display any particularly good qualities when pruned on the short spur method. However, in one season an appreciable increase in yield followed when a few vines were long pruned to the Casanave Cordon system. Further field records would be necessary to ascertain whether these varieties maintain their cropping habits and remain vigorous with long pruning.

* *Melanconium fuligineum.*

Conclusions.

The climate of the Charters Towers district is not ideally suited to grape-growing generally.

A few varieties thrive and yield profitable crops of fruit but their lives are greatly shortened by the mild winters, which do not permit the vines a normal period of dormancy; furthermore, the ravages of termites seriously undermine the constitution of the vines.

Strong-growing varieties which thrive and crop best under the existing conditions are therefore recommended for planting in this area.

Results of the variety trial plot indicate that Servant is the most reliable variety which can be recommended for future planting.

White Wax and Ohanez are the next most promising but, until further data is collected as to their bearing qualities with long pruning, plantings should be made with caution.

Black Prince and Henab Turki require close observation under long pruning for at least another two seasons. This can be carried out under normal field conditions.

Gros Colman and Chaouch can be regarded as unsuitable until bird attack and bitter rot can be overcome.

Acknowledgment.

Thanks are due to Mr. A. H. Richardson, on whose Sellheim property these trials were carried out.

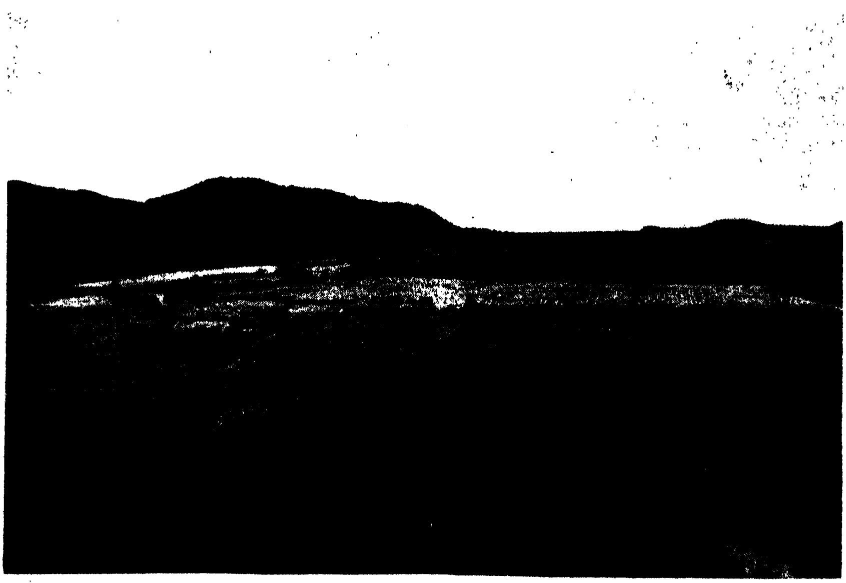


Plate 85.

NEAR JAPOON, NORTH QUEENSLAND.

PLANT PROTECTION

Stored Products Pests.

N. E. H. CALDWELL, M.Agr.Sc., Horticulturist.*

INSECT and related pests which feed on the wide range of commodities usually referred to as stored products are responsible for considerable losses in this State. Such commodities include grain and grain products, dried fruits and vegetables, nuts and nut meats, and products of animal origin such as ham and cheese as well as the numerous foods for both human and stock consumption which are prepared from one or more of these main classes of raw materials. The majority of the pests involved are either beetles or moths; the remainder make up a miscellaneous group which includes flies, psocids, and mites.

The beetles include several weevils but most of them are not true weevils, though they are commonly referred to as such. They are nearly all rather small, hard-bodied insects. Both the adults and larvae of these species feed in the infested material throughout their life and thus are usually found together. The adults of several species are very long-lived, some surviving for at least three years.

The adults of moth pests, on the other hand, do not feed on stored products and thus cause no direct injury in this stage of their life. Their mature larvae usually either leave the infested material before pupating or they pupate in such a position that the moths on emerging from the pupae may readily escape into the open. Thus the moths of these stored products pests are commonly found resting on the containers of the infested material, or on the walls of—or flying round—the building in which the goods are stored. In this stage, too, they live for only a week or two. The larvae of these moths characteristically spin silken threads wherever they go and also construct silken cocoons, this habit distinguishing them quite definitely from beetle larvae.

Pests in the miscellaneous group have no general characteristics in common. Psocids and mites are very small, the latter being scarcely visible to the naked eye. As is the case with beetles, all stages of psocids and mites are found together in the infested material. The adults of fly pests, on the other hand, are usually seen resting on or flying round the material in which their larvae are feeding.

A number of pests of different classes of stored products are discussed briefly in the following pages. As the measures adopted for controlling all these species are broadly similar, they are dealt with in a final section of this article following the discussion of the individual species.

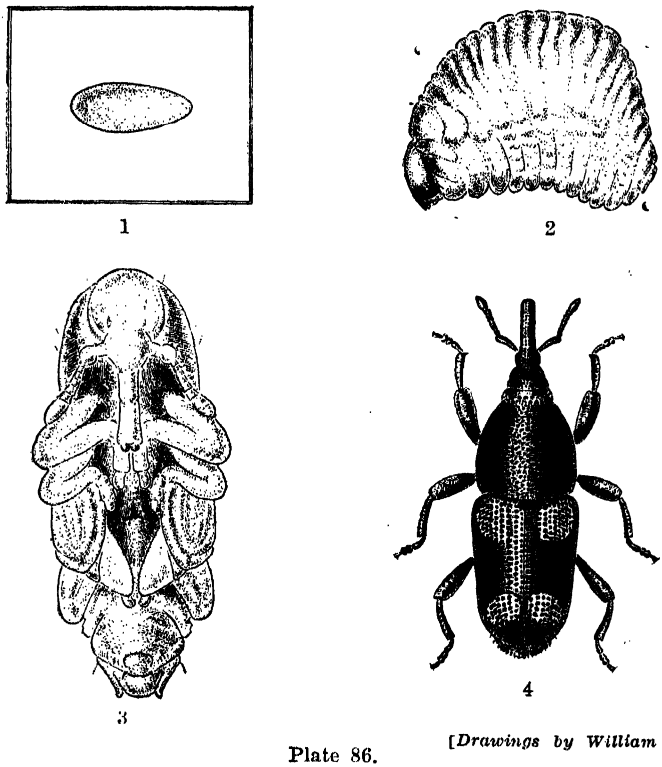
* Formerly Entomologist, Science Branch.

A.—Pests of Stored Cereals and Other Seeds.

The more important pests of stored cereals and other seeds are rice weevil, lesser grain borer, Angoumois grain moth, and pea and bean bruchids. The status, life history and habits of these species are discussed in this section.

RICE WEEVIL.

First recorded as a pest of rice, from which its common name is derived, the rice weevil* is a widespread enemy of stored maize, wheat, sorghum, rice, and other grains as well as of certain processed foodstuffs such as macaroni. Both the adults and larvae of this species feed on the grain or other foodstuff, but the bulk of the damage is done by the larvae. Grains may be completely hollowed out and the whole mass reduced to a heap of husks and debris by the feeding of successive generations of this pest. Grain with a high moisture content is very susceptible to attack by the rice weevil, but fortunately much of Queensland's wheat is very dry when harvested and, provided it is stored under suitable conditions, wastage in this case is slight. The moisture content of maize, on the other hand, is normally high and favourable for rapid breeding; the incidence of the pest in this cereal is thus usually serious. It is also characteristic of the rice weevil that it requires a solid medium in which to breed. Finely-milled products, such as flour are, therefore, not attacked and the occurrence of the insect in them is only accidental.



[Drawings by William Manley.

Plate 86.

RICE WEEVIL.—Fig. 1, Egg × 30; Fig. 2, Larva × 12½; Fig. 3, Pupa × 15; Fig. 4, Adult × 12½.

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* *Calandra oryzae* L.

Life History and Habits.

The adult rice weevil (Plate 86; fig. 4) is a small, dark-brown insect measuring about one-sixth of an inch in length, with two lighter coloured, irregular marks on each of the two wing covers. It has the typical elongate snout of the weevil family, which in this case is turned downwards at right angles to the body. The weevil may live for from four to five months and during that time the female lays up to 400 eggs. Each egg (Plate 86; fig. 1) is placed in a small cavity bored by the female into the grain or other material in which the larva feeds. The white, legless larva (Plate 86; fig. 2) hatches in a few days and burrows into the grain, where it feeds for two or more weeks. When full-grown, it pupates (Plate 86; fig. 3) in the material in which it has been feeding and the adult emerges about a week later. The life cycle thus may be completed in less than a month in mid-summer, though a considerably longer time is required for the completion of development during the colder months. In coastal Queensland there are probably six or seven generations annually.

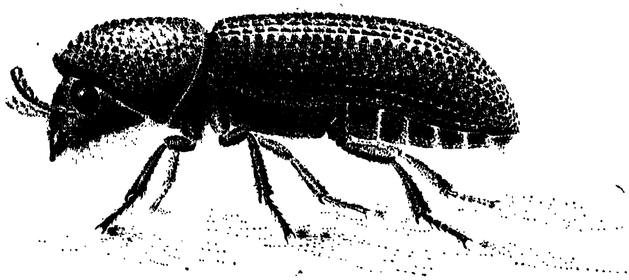
The closely-related granary weevil*—a very common pest in more temperate climates—which has habits very similar to those of the rice weel, is unimportant in Queensland.

LESSER GRAIN BORER.

The lesser grain borer† is primarily a pest of whole grain. In wheat and maize it may at times be very destructive though it is not so general in its occurrence in Queensland as the rice weevil. Stock foods derived from cereals, particularly those containing crushed grain, may also be heavily infested by it. Foodstuffs for human consumption, such as barley, oatmeal, wheatmeal, and wholemeal flour are also commonly attacked but the presence of this pest in the more highly refined products such as white flour is rather unusual. The beetle of this species is equipped with powerful jaws which enable it to bore directly into sound grain. The combined activities of both adults and larvae, therefore, can be very destructive. The species will thrive in grain with a somewhat lower moisture content than that required for the development of the rice weevil.

Life History and Habits.

The shiny, dark-brown or black lesser grain borer beetle (Plate 87) is very small, being only about one-tenth of an inch in length, and can readily be distinguished from other grain beetles by its slender, cylindrical form. The female may produce from 300 to 500 eggs and these are



[*Drawing by William Manley.*

Plate 87.

LESSER GRAIN BORER.—Adult × 25.

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* *Calandra granaria* L.

† *Rhizopertha dominica* F.

laid singly or in clusters on the grain. They hatch in a few days and the small, whitish grubs emerging from them crawl actively about through the foodstuffs. They may then bore directly into slightly damaged grain and there complete their development. The period elapsing from egg to adult may be of about a month's duration in summer.

ANGOUMOIS GRAIN MOTH.

The Angoumois grain moth* is a cosmopolitan species, the larvae of which feed on cereals. Overseas this species is considered a very important pest of stored grain, but in Queensland it can hardly be regarded as being in that category.

Life History and Habits.

The adult of this species is a very small moth measuring approximately half an inch across the outstretched wings and is yellowish-brown to buff in colour. On account of its small size and pointed, fringed wings it is not likely to be confused with other moths infesting grain. Its eggs may be laid either on the ripening ears of grain in the field or directly on the grain in storage. As many as several hundred eggs may be laid by one moth of this species though the average is less than one hundred. The egg is white when first laid but it soon changes to a reddish colour. On hatching, the young larva bores into a grain kernel and there completes its development, the full-grown larva, which is white in colour, being about one-quarter of an inch in length. Pupation takes place in a silken cocoon spun just beneath the surface of the seed after the larva has prepared for the exit of the moth by partly cutting a circular hole through the seed coat. After emerging from the pupa the moth pushes its way out through this hole and escapes from the grain kernel. The period which elapses from the laying of the egg to the emergence of the adult may be of five weeks' duration under very favourable conditions but generally is considerably longer.

PEA AND BEAN BRUCHIDS.

The pea and bean bruchids† are small, weevil-like insects which attack the seeds of peas and beans. Infestation frequently takes place in the field before the seed is harvested and generation after generation of the beetles may breed in the stored seed, eventually completing its destruction unless control measures are undertaken.

Life History and Habits.

Bruchid beetles (Plate 88; fig. 4) are stoutly-built, about one-eighth to one-fifth of an inch in length, and brown or reddish-brown in colour with grey, white, dark-brown or black patches on the back. The oval, whitish eggs (Plate 88; fig. 2) are laid singly on the outside of the seed and firmly glued to the surface. On hatching, the young larva bores directly into the seed beneath the egg and there feeds voraciously until it is full grown (Plate 88; fig. 1). It then transforms to the pupa (Plate 88; fig. 3), the pupal stage being spent within the seed. When the adult is ready to emerge, it cuts a clean, circular hole in the seed coat, which

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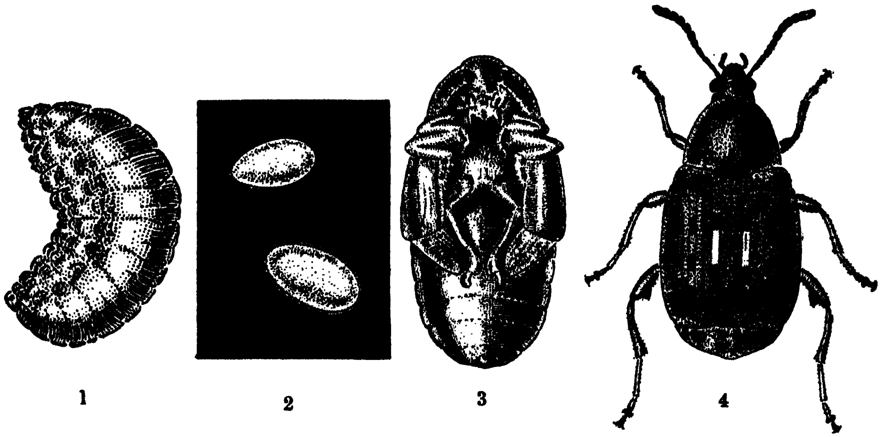
* *Sitotroga cerealella* Oliv.

† Family *Bruchidae*.

gives a characteristic appearance to infested seeds from which the adults have escaped. Development is rapid and there are probably several generations a year in Queensland.



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[*Drawings by William Manley.*

Plate 88.

BEAN BRUCHID.—Fig. 1, Larva × 10; Fig. 2, Egg × 25; Fig. 3, Pupa × 10; Fig. 4, Adult × 10.

MINOR PESTS OF STORED CEREALS AND OTHER SEEDS.

Many other species of lesser importance may be found in association with stored cereals and other seeds. Among them are flour beetles, saw-toothed grain beetle, cadelle beetle, flat grain beetle*, rice moth, Indian meal moth, meal moth†, psocids, and mites.

Control.

Control measures for the pests of stored cereals and other seeds, which are discussed at length at the end of this article, include:—(*a*) sanitation in storage premises, (*b*) the use of sprays in storage premises, (*c*) fumigation of storage premises, (*d*) fumigation of infested products in fumigation chambers, tanks, or other suitable containers, under tarpaulins, &c., and (*e*) storage with paradichlorobenzene and/or naphthalene.

B.—Pests of Flour and Other Milled Cereal Products.

Flour and other milled cereal products pests of importance which are discussed in this section are flour beetles, Mediterranean flour moth, cadelle beetle, biscuit beetle, rice moth, psocids, and mites.

FLOUR BEETLES.

Flour beetles are a group of small insects commonly found—as their name would indicate—in flour and related products though some species also feed on many other foodstuffs and are amongst the most widely distributed of all stored products pests. They are frequently referred to by other common names, such as flour weevils, bran bugs, or—in the milling industry—as scavenger beetles or brownies.

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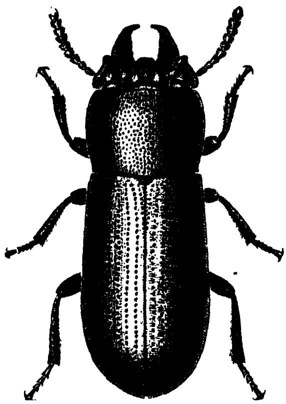
* *Laemophloeus minutus* Oliv.

† *Pyralis farinalis* L.

Commodities in which these beetles may be found—frequently in very large numbers—include flour of all types, bran, pollard, wheatmeal, oatmeal and practically any other human or stock foods containing grain or grain products. They may also infest whole grains—such as wheat, rice and barley—nuts, nut meats and dried fruits, though they are not important pests of these products.

The rust-red flour beetle* is the commonest species in Queensland, where it is a serious menace to stored foodstuffs, particularly in northern areas. The confused flour beetle† is the dominant species of this group in flour mill machinery. However, it occurs in all parts of the State and occasionally it may be very numerous in some stored products. The broad-horned flour beetle‡ (Plate 89) is equally widespread and is usually found in association with the more important species already mentioned, though in smaller numbers. Other species of the group, such as the long-headed flour beetle§ and the depressed flour beetle¶ are unimportant.



[*Drawing by William Manley.*

Plate 89.

BROAD-HORNED FLOUR BEETLE.—Adult × 12½.

Life History and Habits.

The rust-red flour beetle—which may be regarded as being typical of the flour beetles—is an active, shining, reddish-brown, elongate insect (Plate 90; fig. 1) measuring about one-eighth of an inch in length. The female beetle of this species may lay several hundred very small white eggs, which are deposited indiscriminately in the infested material. They may hatch in as short a time as three days under extremely favourable conditions but more usually the incubation period lasts for a week or more. From the eggs emerge slender, cylindrical, worm-like larvae which are normally brownish-yellow in colour and somewhat leathery in appearance. These larvae feed for three weeks or more before they become full-grown, at which stage they measure one-sixth of an inch in

* *Tribolium castaneum* Herbst.

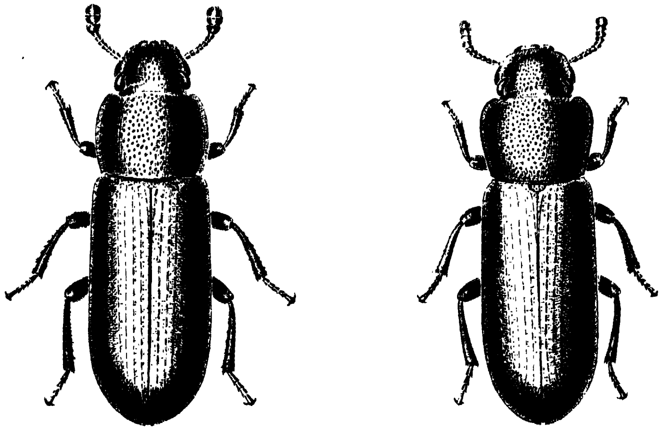
† *Tribolium confusum* J. du V.

‡ *Gnathocerus cornutus* F.

§ *Latheticus oryzae* Waterh.

¶ *Palorus subdepressus* Woll.

length. They then pupate anywhere in the foodstuff in which they have been feeding. On emergence from the pupal stage the adults are noticeably pale but their colour deepens to the characteristic reddish-brown in a day or two. The life cycle is sometimes completed in about five weeks but may be of much longer duration if the temperature is low or the foodstuff is not particularly suitable for the species.



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[*Drawings by William Manley.*

Plate 90.

FLOUR BEETLES.—Fig. 1, Rust-red flour beetle, Adult × 15; Fig. 2, Confused flour beetle, Adult × 15.

The other flour beetles in Queensland are very similar to the rust-red flour beetle in appearance, and in life history and habits. The adults of all species are very long-lived; the confused flour beetle (Plate 90; fig. 2) may survive for over three years and the rust-red flour beetle for more than two years.

CADELLE BEETLE.

The cadelle beetle* is another widely distributed species which attacks almost any type of grain or grain product. It is commonly found in flour and other wheat products and is a well-known pest of flour mills, where it is sometimes erroneously referred to as the click beetle. In whole grain, damage may be confined to the germ but in other foodstuffs feeding seems to be indiscriminate. The boring habits of the full-grown larvae frequently result in much damage to woodwork in flour mills and to grain silos and other containers. Extensive damage is also sometimes caused in flour mills by the larvae cutting holes in the silk cloth of sifting machines. Holes in the containers of many packaged foodstuffs, which are frequently due to the presence of this pest, permit the entry of other species which could not otherwise gain access to them.

Life History and Habits.

The adult cadelles are elongate, flattened beetles (Plate 91) measuring about one-third of an inch in length and are thus much larger than the majority of beetles found in stored products. They are long-lived, many surviving for from one to two years. The females lay eggs for the

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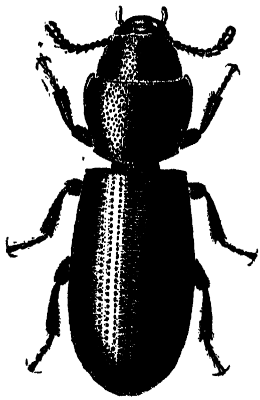
* *Tenebroides mauritanicus* L.

greater part of their life and may deposit up to one thousand during that period. The white, elongate eggs are comparatively large and may hatch in as short a period as seven days in warm weather. The



[*Drawing by William Manley.*

Plate 91.

CADELLE BEETLE.—Adult × 7½.

larvae emerging from them may take from two months to over a year to complete their development, by which time they have attained a length of about three-quarters of an inch. They are greyish-white in colour, with the head, the adjacent segment, and the two horny points at the end of the body, black or dark-brown in colour. They may be distinguished from the larvae of other beetles infesting stored products by their large size and fleshy appearance, and from the larvae of moths—many of which are of approximately the same size—by the black, horny points at the end of the body and, of course, by the fact that they do not spin silk. Pupation takes place in cells formed in the foodstuff or in holes bored into adjacent woodwork by the full-grown larvae. Both adults and larvae may live for long periods without food, sheltering in secluded places in bins and other containers, from which they emerge to infest fresh stocks of grain or other commodities.

BISCUIT BEETLE.

The biscuit beetle*, which is sometimes called the drugstore beetle because of its habit of attacking dried herbs and other dried plant products used by pharmacists, also infests a great variety of stored foods, seeds, and other materials. In Queensland it is commonly found in crushed grains, pre-cooked breakfast foods, biscuits, and some condiments such as Cayenne papper.

Life History and Habits.

The adult of the biscuit beetle is a rather oval, reddish-brown insect, measuring about one-tenth of an inch in length, and is very like the better-known tobacco beetle in appearance, with which it is sometimes confused. Its larvae are white in colour and its life cycle is much the same as that of the tobacco beetle, being completed under favourable conditions in less than two months. Breeding will take place in almost any substance attacked by the adults.

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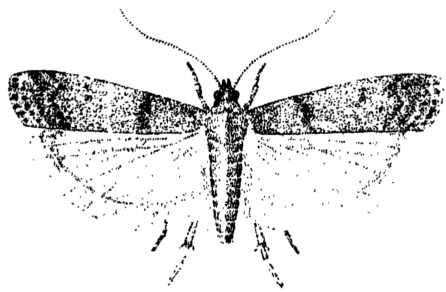
* *Stegobium paniceum* L.

MEDITERRANEAN FLOUR MOTH.

The Mediterranean flour moth* is a very well-known insect with a world-wide distribution. In Queensland, as elsewhere, it is primarily a pest in flour mills but occasionally flour, and especially wholemeal flour, stored away from the mill may be infested. It is also frequently found in other premises where cereals are ground or otherwise processed. Like all moth larvæ infesting stored products, those of this species spin silken threads wherever they go and construct loose silken tunnels in which they live. Thus particles of the material in which they are feeding become matted together, with small pellets of excrement conspicuously attached to the webbing. In flour mills the webbing produced may be so dense as to clog up the machinery completely.



[*Drawing by William Manley.*

Plate 92.

MEDITERRANEAN FLOUR MOTH.—Adult × 2½.

Life History and Habits.

The adult of the Mediterranean flour moth (Plate 92) is predominantly grey in colour, with wavy, transverse black lines across the forewings, which, when outstretched, are a little less than an inch across. When the moth is in the normal resting position with the wings folded it is about half an inch in length. The small, white eggs are laid in crevices or scattered about in the mill machinery or in accumulations of flour and other grain products. Under some conditions the eggs hatch in less than a week and the larvæ complete their development in about six weeks. At maturity the larvæ are rather more than half an inch in length and are white or pinkish-white in colour. They then spin silken cocoons in which pupation takes place and from which the adults may emerge in about a week. In warm weather the life cycle may thus be completed in eight weeks or a little longer.

RICE MOTH.

The rice moth† is an extremely important pest, particularly in the coastal and sub-coastal areas north of the Tropic of Capricorn. There the larvae infest a wide range of commodities and may be present in very large numbers. Grain products of all kinds may be seriously infested and appear to constitute the favoured foodstuff of the species, but it also occurs in whole grains such as wheat, maize, and rice, cotton seed, nuts and nut meats, dried legume seeds, dried fruits, and all kinds of processed commodities containing some or all of these ingredients.

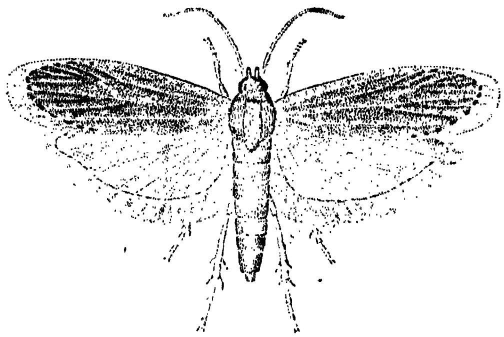
* *Ephestia kuehniella* Zell.

† *Corcyra cephalonica* Staint.

Rice moth larvæ have also been found on uncooked ham and later reared to maturity on this foodstuff. The larvae spin copious quantities of silken threads and construct dense silken tubes during their feeding. These tubes are usually attached to the inside of flour sacks and other containers and may form a dense mat which can be peeled off in large quantities when the infestation is serious. Some webbing, together with pellets of excreta, may be pushed out through the mesh of hessian sacks, giving a somewhat characteristic appearance known in the trade as cobweb or weeping.

Life History and Habits.

The rice moth adult is fawny-grey in colour, with a few, slightly darker streaks on the forewings (Plate 93). Though rather variable in size, it is usually larger and somewhat stouter in build than other warehouse moths, being approximately half an inch in length and about seven-eighths of an inch across the expanded wings. The female is generally larger than the male. The small, whitish eggs are laid singly



[*Drawing by William Manley.*

Plate 93.

RICE MOTH.—Adult × 3.

and are attached securely to rough surfaces such as walls and sacks, each female laying from 100 to 200 eggs. The whitish larvae may hatch from the eggs in less than a week and reach maturity under favourable conditions in as few as five weeks, though this period may be much longer under other conditions. When full-grown, the larvae usually exceed half an inch in length and are dirty-white in colour, sometimes with a grey or slightly bluish tinge. The pupal stage, which is spent within a tightly woven cocoon, occupies little more than a week. During the summer in North Queensland the life cycle may be completed in six to seven weeks.

PSOCIDS.

Psocids or booklice are minute insects frequently found in association with grain and grain products or other dried vegetable matter. Sometimes they are present in enormous numbers, swarming over the surface of the infested material. They may also be found living in small accumulations of spilled goods and dust-like deposits of flour. Their presence in any numbers is usually an indication that the infested material has been held in stock too long or that it is stored under

insanitary conditions. The common species* of booklice in Queensland is yellowish-white in colour and not more than one twenty-fifth of an inch in length.

MITES.

Mites† associated with stored products are microscopic in size, soft-bodied, and usually pale in colour. On account of their small size they are seldom seen, pale species being especially difficult to detect in substances such as flour. When present in large numbers, the movement of the very small creatures on the surface gives a characteristic appearance to materials such as flour. They also impart to it a well-recognized musty odour. Flour is one of the commonest commodities to be affected in Queensland, especially if stored for an unduly long period, but grain and grain products generally, dried fruits, cheese, dried meats, and other types of food may be attacked. Serious infestation by these pests is, however, usually a sign of over-long storage. Mites multiply extremely rapidly, are capable of withstanding very adverse conditions, and generally are very difficult to control.

MINOR PESTS OF FLOUR AND OTHER MILLED CEREAL PRODUCTS.

Additional pests of flour and other milled cereal products include lesser grain borer, saw-toothed grain beetle, flat grain beetle, corn sap beetle, yellow meal worms‡, black fungus beetle§, spider beetles¶, tobacco beetle, Indian meal moth, meat moth, and fig moth.

Control.

Control measures for these pests of flour and other milled cereal products are discussed in the final section of this article. They consist of:—(*a*) sanitation in manufacturing, packing or storage premises, (*b*) the use of sprays in such premises, (*c*) fumigation of such premises, (*d*) the use of high temperatures, (*e*) the use of low temperatures, and (*f*) fumigation of infested products in fumigation chambers, tanks, or other suitable containers, under tarpaulins, &c.

C.—Pests of Dried Fruits, Nuts, and Nut Foods.

Dried fruits, nuts, and nut food pests discussed in this section are saw-toothed grain beetle, corn sap beetle, fig moth, and Indian meal moth.

SAW-TOOTHED GRAIN BEETLE.

Despite its common name, the saw-toothed grain beetle|| is best known in this State—in which it is widely distributed—as a pest of dried fruits. However, it also infests a wide range of other stored products, including wheat, stock foods containing wheat or other grain

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* *Troctes divinatorius* Müll.

† *Thyraeophagus entomophagus* Lob. and other species.

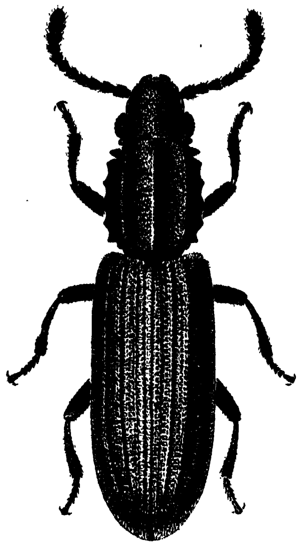
‡ *Tenebrio molitor* L.

§ *Alphitobius piceus* Oliv.

¶ *Gibbium psylloides* Czemp. and other species.

|| *Oryzaephilus surinamensis* L.

products, rice, barley, flour, and other cereal foodstuffs such as wheatmeal, peanuts and other nuts, nut meats, and processed foodstuffs such as biscuits, breakfast foods, and chocolate.



[Drawing by William Manley.

Plate 94.

SAW-TOOTHED GRAIN BEETLE.—Adult × 25.

Life History and Habits.

The adult of this species is a very active, slender, dark-brown beetle (Plate 94), measuring about one-tenth of an inch in length. The sides of the thorax bear six tooth-like projections which give the species its common name and which serve to distinguish it from other beetles found in stored products. The adults normally live from six to ten months but some may even survive for as long a period as three years. The small, white, elongate eggs, of which the female has been known to produce nearly 300, are laid anywhere in the foodstuff and usually hatch in less than a week. The larvae, which are also white, move actively through the material in which they are feeding and become full-grown in about two weeks under favourable conditions. They then pupate in fragile cells made by binding together fragments of the infested foodstuff, the pupal stage lasting about a week. The life cycle may thus be completed in less than a month though it usually extends over a longer period.

CORN SAP BEETLE.

The corn sap beetle* normally feeds on decaying fruit and vegetables or on sap exuding from injured plant tissue, but it is frequently found also in association with various types of stored products. Very heavy infestations have been observed in stored peanuts, while rice, pearl barley, flour of various types, and other grain products may also be attacked. At times, the larvæ swarm in large numbers over infested premises.

* *Carpophilus dimidiatus* F.

Life History and Habits.

The adult insect is a small, dark-brown to black beetle whose wing covers are rather lighter in colour than the rest of the body. These covers do not reach the full length of the insect's abdomen, the tip of which is therefore exposed, thus giving this beetle, and several closely related species, a characteristic appearance amongst stored product pests. The corn sap beetle measures about one-tenth, or slightly more, of an inch in length. The larvae hatching from the eggs laid by it are white in colour and fairly active in their movements.

FIG MOTH.

The fig moth* is closely related to the Mediterranean flour moth, but in Queensland it is very widely distributed and much more important than the latter species—except in the flour milling industry. Though perhaps best known as a pest of dried fruits, peanuts, other nuts, nut meats and processed foods containing these materials, this species is an important pest of flour, bran, pollard, and other grain products, and dried vegetables such as peas. Infestation of whole grain such as maize has also been observed. Like the larvae of other moth species, those of the fig moth spin silken threads wherever they go, matting together the particles of the foodstuff as well as their excrement.

Life History and Habits.

The adult of the fig moth is somewhat smaller than its relative, the Mediterranean flour moth, being about three-eighths of an inch in length with the wings folded and not more than three-quarters of an inch across with the wings outstretched. It is predominantly grey in colour, sometimes with a slightly fawny tinge, with a distinctly darker grey, straight band across the middle of the forewings. The eggs are laid anywhere in the foodstuff and the larvae hatching from them wander freely through it as they feed. The full-grown larvae are dirty-white in colour and measure about half an inch or slightly more in length. In late summer and autumn the life cycle of this species may be completed in six to seven weeks.

INDIAN MEAL MOTH.

The Indian meal moth† is another well-known and widely-distributed species which is an important pest of dried fruits, nuts, and nut meats. It may also infest milled cereal products such as flour, bran, and pollard and is perhaps the pest most commonly found in highly processed breakfast foods, though these products are not usually severely infested unless held in stock for unduly long periods or stored under extremely unhygienic conditions.

Life History and Habits.

The adult of the Indian meal moth (Plate 95) has a wing expanse of rather less than three-quarters of an inch and is about three-eighths of an inch in length when the wings are folded. The basal third of the forewings in this species is whitish-grey in colour, whereas the remainder of the surface of the forewings is reddish-brown with a coppery sheen.

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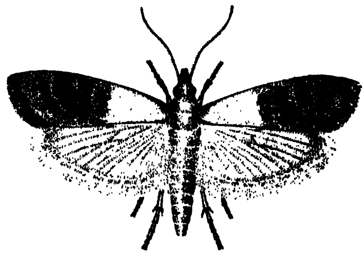
* *Ephestia cautella* Walk.

† *Plodia interpunctella* Hbn.

The possession of such a definite wing pattern serves to readily separate the Indian meal moth from other moth species infesting stored products in this State. The female moth may lay anything from one hundred to three hundred eggs which hatch in a few days into small, whitish larvæ. When full-grown, these larvæ measure about half an inch in length, and are dirty white in colour, sometimes tinged with green or pink. They spin silken cocoons in which they transform into the light-brown pupæ from which, in turn, the adult moths emerge.



[*Drawing by William Manley.*

Plate 95.

INDIAN MEAL MOTH.—Adult × 3.

MINOR PESTS OF DRIED FRUITS, NUTS, AND NUT FOODS.

Other less important pests of dried fruits, nuts, and nut foods are some of the flour beetles, tobacco beetle, rice moth, psocids, and mites.

Control.

Control measures for pests of dried fruits, nuts, and nut foods are discussed in detail later, but may be summarised under the following headings:—(*a*) sanitation in packing and storage premises, (*b*) the use of sprays in these premises, (*c*) fumigation of such premises, (*d*) the use of low temperatures, (*e*) fumigation of infested products in fumigation chambers, tanks, or other suitable containers, and (*f*) fumigation of infested products by the injection of ethyl formate into the packages in which they are enclosed.

D.—Pests of Stored Tobacco.

Brief reference is made in this section to two pests which, in addition to attacking tobacco, will also infest other stored products. They are tobacco beetle and tobacco moth.

TOBACCO BEETLE.

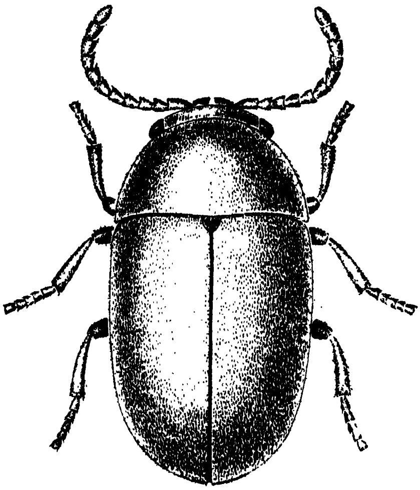
The tobacco beetle* is, as its name implies, a pest of dried tobacco leaf and processed tobacco of all kinds. In Queensland it is of greatest importance as a pest of bulked tobacco on farms. It is also a minor pest of flour and other grain products, and of nut meats.

Life History and Habits.

The adult of this species is a light-brown, oval-shaped beetle (Plate 96) measuring from about one-sixteenth to one-tenth of an inch in length. Each female beetle may lay approximately one hundred very small, white

* *Lasioderma serricorne* F.

eggs, each egg being deposited singly in the infested material. The larvæ which hatch from these eggs—after an incubation period of about a week—are white in colour except for their light-brown heads and are fairly densely clothed with brownish hairs. They become full-grown in from four to ten weeks and they are then one-tenth of an inch in length. The pupal stage is spent within a distinct cell composed of fragments of the infested material; in bulked tobacco these cells are usually located along the midribs or in folds of the leaf. The pupal stage in this species lasts for about a week and the life cycle thus may be completed in some six weeks.



[*Drawing by William Manley.*

Plate 96.

TOBACCO BEETLE.—Adult × 25.

TOBACCO MOTH.

The tobacco moth* is a widely-distributed relative of the Mediterranean flour moth and the fig moth but it is apparently far less common than either of these species in Queensland. As its name suggests, it will attack tobacco and, in many countries, it is a pest of considerable importance in tobacco warehouses. However, like related species, it will also infest a wide range of other materials.

Life History and Habits.

The adult of the tobacco moth is very similar in appearance to the fig moth. Its general colouration, however, is more uniformly grey, the conspicuous transverse marking on the forewings of the latter being either absent or very faint.

Control.

On farms, satisfactory control of these two pests in tobacco can be achieved by strict attention to sanitation and to the fumigation of the bulking sheds.

* *Ephestia elutella* Hbn.

E.—Pests of Commodities of Animal Origin.

This section is devoted to a brief consideration of three pests of commodities of animal origin. These are red-legged ham beetle, dermestid beetles, and cheese skipper, all capable of inflicting serious losses in the commodities which they may infest.

RED-LEGGED HAM BEETLE.

The red-legged ham beetle* is a scavenger species which normally feeds on dead animal matter and thus sometimes attacks cured meats in storage. It may also do considerable damage to stored hides.

Life History and Habits.

The adult of this species is an active beetle measuring about one-fifth of an inch in length, with a steel-blue body and reddish legs, while the larvæ is a white grub measuring about three-tenths of an inch in length when full-grown. The life cycle may take two months or more for completion.

DERMESTID BEETLES.

The dermestids† are a group of beetles which, for the most part, feed on dried animal matter. Thus, not unnaturally, some are pests of hides, furs, and other substances of animal origin. A few species attack cereal products and some are household pests which damage carpets and other furnishings.

Life History and Habits.

There is a wide range in the size, shape, and appearance of dermestid beetles. One of the largest is the rather elongate hide beetle‡ which measures about one-third of an inch in length, the body colour on the back being dark-brown or black whereas the under surface is white. A much smaller species is the varied carpet beetle§, often referred to as the museum beetle. This species is oval in shape, mottled fawn and grey in colour, and measures about one-tenth of an inch in length. The hairy larvæ of the several species of dermestids are very active, and the life cycle of most species is rather long, extending, under unfavourable conditions, over two or three years.

CHEESE SKIPPER.

The cheese skipper is the name given to the larva of a black fly¶ (Plate 97; fig. 1) which is about the size of a small house fly. The larvæ (Plate 97; fig. 2) of this species may infest hams, bacon, and cured fish as well as cheese and are white, legless maggots which derive their name from the habit of propelling themselves by bending into an arc and then straightening out suddenly. They may also crawl about when undisturbed. The life cycle of this species may be fairly brief, being completed in as little as three weeks under some conditions.

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* *Necrobia rufipes* Deg.

† Family *Dermestidae*.

‡ *Dermestes maculatus* Deg.

§ *Anthrenus verbasci* L.

¶ *Piophila casei* L.

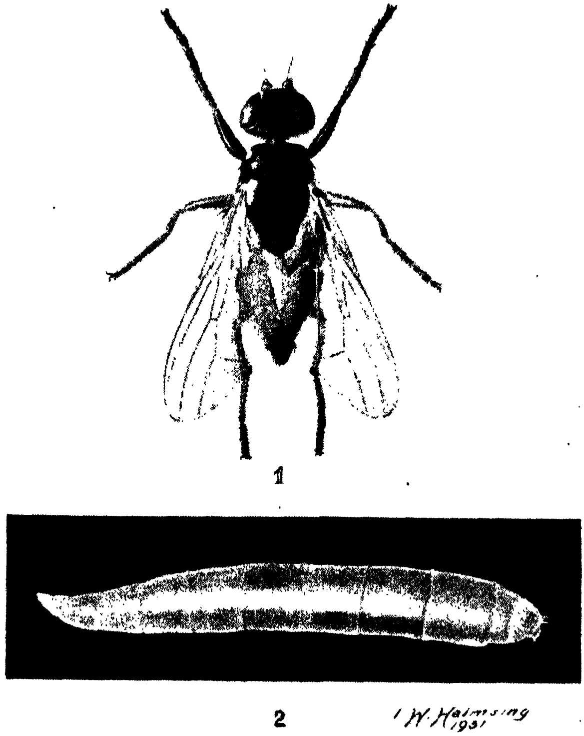


Plate 97.
CHEESE SKIPPER.—Fig. 1, Adult × 9; Fig. 2, Larva × 9.

MINOR PESTS OF COMMODITIES OF ANIMAL ORIGIN.

Mites and psocids may also attack products of animal origin while larvæ of the rice moth have been known to feed on hams.

Control.

Pests attacking commodities of animal origin can usually be satisfactorily dealt with by strict attention to sanitation and by the use of low temperature storage.

F.—Pests of Miscellaneous Materials.

Many other stored products which cannot readily be classified in any broad, general scheme are subject to insect attack. The species involved are, for the most part, those with varied tastes described in previous sections. They include flour beetles, saw-toothed grain beetle, tobacco beetle, biscuit beetle, dermestid beetles, fig moth, Indian meal moth, rice moth, psocids, and mites. The control of these species may involve any of the known methods of treatment, depending on the nature of the commodity infested.

G.—Control of Stored Products Pests.

Merchants, farmers, and housewives may combat insect infestation of stored products by the adoption of a number of control measures. First and foremost among these is strict attention to sanitation in, and to the management of, the storage premises. Actual infestation may be reduced by the use of high and low temperatures and much good may be accomplished by spraying with appropriate insecticides and by the use of fumigants. These various control measures are discussed in the following paragraphs.

SANITATION AND GENERAL MANAGEMENT.

The first essential in the control of stored products pests is strict attention to sanitation in all premises in which goods subject to attack by them are handled; all other control measures should be regarded as supplementary. Sanitation involves not only the maintenance of scrupulous cleanliness but also certain features of management aimed at eliminating, as quickly as possible, all breeding sites of the pests.

Most of the insects concerned in the infestation of stored products can live, and in many cases breed freely, in spilled goods and debris which may accumulate in cracks and crevices, in inaccessible corners, and under floors. Regular and thorough cleaning of the storage premises therefore is the basis of the control programme. If this is not attended to, contamination of fresh stocks begins as soon as they are taken into storage. In addition, the efficiency of other control measures, such as spraying and fumigation, is seriously impaired.

The construction of the buildings has an important influence on the question of sanitation. In a properly-designed structure the maintenance of the required standard of cleanliness is relatively simple; in a badly-designed building it becomes a difficult, if not an impossible, task. A good warehouse or store should have no dark, damp, inaccessible corners, and floors and walls should be free from cracks and ledges where debris may lodge. For this reason a smooth-finished concrete is the best type of construction. Any cracks in the structure should be filled with plastic bitumen or some comparable product, particular attention being paid to the junction between walls and floor. Regular applications of paint are helpful in sealing cracks in wooden walls and should be made with a spray gun, preferably after one of the periodical cleanings of the premises.

Walls, beams, and ledges should all be swept as well as the floors. Vacuum cleaners are particularly useful in cleaning corners and cracks and should be used in storage premises wherever practicable. Sweepings should be removed from the buildings at once and destroyed, preferably by burning. On no account should they be swept into a corner or under the steps or bagged and held on the premises for disposal later.

Certain commodities, such as bran, pollard and other stock foods, are more prone to heavy insect infestation than are highly processed goods. The risk of cross-infestation from the former is, therefore, great and accordingly stock foods should never be housed in the same premises as goods for human consumption. In the same way, even amongst the latter type of commodities, those particularly susceptible to insect attack, such as wholemeal flour, should, as far as possible, be isolated from other goods.

The correct rotation of stocks is an important phase of pest control work both in the home and in places where stored products are handled on a bulk scale. As a general rule, the oldest stocks on hand should be used first. Therefore, it is essential that a systematic method of stacking should be employed so that the oldest stocks are always readily accessible. All stocks, however, should be checked at frequent intervals and any which are unfit either for immediate consumption or for reconditioning should be removed at once and destroyed.

Since warm, moist conditions are usually favourable for the development of stored products pests, any measures designed to keep stocks cool and dry are worthwhile. In addition to the proper design and construction of buildings, such measures include the installation of fans, the use of dunnage under stacks to allow air circulation beneath them and a stack layout which permits maximum ventilation. Passageways should always be left betweeen walls and adjacent stacks and between the several stacks. These passages should preferably be wide enough to permit a man to walk along them.

CONTROL BY HEAT TREATMENT.

Heat can be used to control some insect pests and may, in certain cases, be applied easily and cheaply for this purpose. A high degree of heat is not required because most insects are killed if they are exposed to a temperature of about 125°F. for a few minutes. The chief difficulty in the application of this control measure lies in ensuring that the whole of the infested environment reaches the desired temperature, special provision being necessary to achieve this result. Even entire buildings may be heat-treated satisfactorily, especially in hot weather, provided they are well-built and specially equipped with a network of steam pipes for raising the temperature.

Heat is used to kill insects in a wide range of processed foodstuffs for which purpose specially constructed rooms are employed. These are fitted with controls to give a constant temperature of about 130°F. and the goods can be held in them until a uniform temperature is attained throughout each package.

In the home, small quantities of foodstuffs can be heated in ovens by spreading the material on trays in layers not more than two inches deep. By the time the surface temperature has reached about 170°F. the centre of the layer should be about 125°F. In gas ovens, this can usually be attained by keeping the flame as low as possible, turning off the gas when the temperature reaches 180°F. and then leaving the material in the oven with the door closed for half an hour. With the aid of a thermometer this treatment can be simply managed in any type of oven but, even in the absence of such an instrument, much can be done by the exercise of a little care. With flour a temperature above about 170°F. should be avoided, as the baking quality may be seriously impaired by higher temperatures. With most other products it is usually sufficient to ensure that charring does not take place. Frequent stirring will greatly assist uniform heating and reduce the risk of scorching.

LOW TEMPERATURE CONTROL.

Cold also may be employed at times as a pest control measure. At moderately low temperatures—40°F to 55°F.—most foodstuff pests lie dormant and damage in infested goods may be arrested by storage at

these temperatures. Several weeks of storage under such conditions will kill many insects. Comparatively short exposures to temperatures below freezing point are also fatal to many species.

CONTROL BY SPRAY APPLICATIONS.

Sprays of various kinds find a place in the control programme for stored products pests. Most of the commoner sprays employed for this purpose must come in contact with the insects to be controlled and good results can be obtained from their use only if the premises in which the goods are stored are kept clean. Accumulations of spilled stock and debris will frequently protect any insects in them from the effects of the sprays and thus impair the efficiency of the whole operation. Due precautions also must be taken to ensure that flour and other susceptible commodities are not tainted by the odour of the spray used.

A fuel oil such as dieselene or some similar product may be sprayed liberally on floors and walls, particularly in grain sheds or other buildings where grains and stock foods are stored. Dunnage also should be treated after being taken up and brushed down. No commodities liable to absorb odours should be allowed to remain in the sprayed section while treatment is in progress and the whole building should be thoroughly aired for at least 24 hours before goods are stacked on the treated area. Liberal treatment with such an oil or even a cruder product is also advisable beneath steps and landing stages, and in other places outside the building where debris accumulates.

Sprays containing a pyrethrum extract and D.D.T. in an oil base, with or without other organic insecticides, are a valuable aid in suppressing stored products pests, notably moths, though they also have a considerable effect on beetles and some other species. Normally these sprays are available as proprietary fly mixtures. They depend for their action not only on their ability to kill many insects when sprayed directly on them but also on the fact that some species, principally moths, are killed if they come in contact with adequately-sprayed surfaces, such as walls of rooms and outsides of cases, even some considerable time after treatment.

Sprays must be applied in an atomised form. All walls and outside surfaces of containers—where accessible—should be sprayed at weekly intervals. When stacks of cases, for instance, are broken during the ordinary working of the store and fresh surfaces exposed, those surfaces should be treated on the same day. Small hand atomisers are satisfactory for domestic use but for the adequate treatment of warehouses and their contents a power-operated, compressed-air plant operating a gun of the paint-spray type is necessary.

Many fly sprays have a kerosene base and hence are liable to cause tainting of certain commodities. Where the oil base is odourless the risk of tainting is completely eliminated. Unless it is known that an oil of the latter type has been employed in their manufacture, sprays should not be applied directly to the outside of absorbent containers such as sacks.

FUMIGATION CONTROL MEASURES.

The use of fumigants in the control of pests of stored products may be discussed conveniently from three aspects, namely (1) fumigation of buildings, (2) fumigation of products in stores and (3)

fumigation of products on the farm. In connection with fumigation of stored products, whether in a warehouse or on a farm, it must be remembered that, while efficient fumigation may destroy all insects present at the time of treatment, it will not prevent reinfestation. Fumigated products therefore must be stored in insect-proof containers or on premises as free from infestation as possible. The latter point emphasises once more the importance of sanitation.

Fumigation of Buildings.

The treatment of buildings by fumigants is usually a rather difficult and costly operation and should be undertaken only when simpler measures have failed to keep insect pests in check. Fumigation is not a substitute for routine hygienic measures and, as with spraying, it should always be preceded by a thorough cleaning of the whole premises. Successful treatment is possible only when the buildings can be made reasonably airtight. This is usually difficult to achieve and in poorly-constructed buildings may be almost impossible. The whole operation of fumigation of buildings should be undertaken only by thoroughly trained and experienced persons and is best done by firms which specialise in this type of work. The fumigant most commonly used in the treatment of buildings is hydrocyanic acid gas, which is very poisonous to human beings and animals and must be handled with the greatest care.

Fumigation of Products in Stores.

Stored products may be fumigated in several ways, depending on the type and quantity of material to be treated and on the facilities which are available.

Vacuum chamber fumigation represents the most highly specialised method of treatment but the facilities required for its adoption are rather elaborate and are not generally available. It necessitates the provision of a specially-constructed steel chamber or vault which is capable of withstanding external atmospheric pressure when exhausted of air. After the chamber has been filled with the commodities to be treated, much of the air which it contains is pumped out and replaced by the fumigant. Vacuum fumigation has the three-fold advantage of high efficiency, rapidity of treatment, and economical use of the fumigant. As compared with the 24-36 hours required for treatment by other methods, vacuum fumigation of some commodities may be carried out in as short a period as 90 minutes. Much less fumigant is used than is required normally for treatment by any other method. Vacuum fumigation is particularly valuable for the treatment of tightly-packed goods such as flour and cased dried fruits, which are difficult to deal with by other methods, and also for perishable commodities which must be handled quickly. The fumigants commonly employed in vacuum chamber treatment are ethylene oxide and ethylene dichloride.

Atmospheric chamber fumigation, in which treatment is carried out at normal atmospheric pressure in air-tight buildings or rooms, is used extensively with many types of commodities. A suitable chamber may be constructed fairly cheaply using a non-porous material, though considerable care must be taken to ensure that it is as gas-tight as possible.

Provision should be made in such a chamber for the circulation of the gas during fumigation and for removing it after treatment and fittings should be provided for the introduction of the fumigant. In atmospheric chamber fumigation the materials generally used are hydrocyanic acid gas, carbon bisulphide, methyl bromide, ethylene dichlorides and, for some special purposes, ethyl formate.

Fumigation of Products on the Farm.

Bin fumigation is the method most suitable for use on the farm. It involves the treatment of commodities, usually in comparatively small quantities, in some suitable container such as a tank, drum, or well-constructed box which is reasonably air-tight. The goods to be fumigated are placed in the container, the fumigant—which must be of the heavier-than-air type—is then introduced, and the top of the bin is closed with a tight-fitting lid or with a thick layer of canvas or sacking.

Grain, either loose or in sacks, can be fairly satisfactorily treated with a heavier-than-air fumigant under a tarpaulin or other type of covering weighted down at ground level. Rubberized sheets, if procurable, are the best type of covering, but any closely-woven fabric may be used. Success with this method will be achieved only if the floor on which the grain is resting is solid and thus reasonably gas proof.

Carbon bisulphide, one of the oldest fumigants, is still the most suitable for use on the farm and satisfactory results can be obtained with it in bin fumigation, or fumigation under tarpaulins or other coverings. This substance is a heavy liquid with an unpleasant odour. It is highly inflammable and should not be exposed near naked lights, electric switch gear, or hot pipes. When fumigating with it the liquid is poured into shallow containers or on to several layers of bagging on top of the material being treated. The liquid vaporises and the gas, being heavier than air, sinks towards the bottom of the container, which should be left undisturbed for 36 hours, except in the case of certain seeds, such as cowpeas and related varieties, when only 24 hours' exposure is considered desirable. At the end of the necessary period, the container is opened and the contents aired thoroughly.

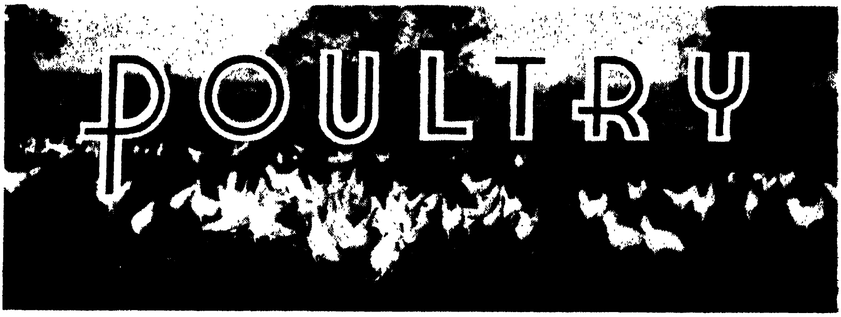
The dosage rate in carbon bisulphide fumigation depends on the degree of air-tightness of the container being used. In thoroughly gas-tight tanks and drums, 4 to 5 lb. of carbon bisulphide to every 1,000 cubic feet of container is sufficient. Thus a box measuring 4 feet by 3 feet by 2 feet—24 cubic feet—would require 2 oz. of fumigant if used at the rate of 5 lb. per 1,000 cubic feet. With less gas-tight containers the dosage must be increased until, for treatment under tarpaulins, it should be as high as 15 lb. per 1,000 cubic feet. Best results are obtained at high temperatures and, where possible, fumigation with carbon bisulphide should be avoided when the temperature drops below 70°F.

The risk of tainting foodstuffs with this fumigant is small, except perhaps with some of the more oily products such as nut meats, and airing after treatment is normally sufficient to dissipate any residual odour of the fumigant.

For the present, it appears that carbon bisulphide will continue to fulfil farmers' fumigation requirements. It may be, however, that as they become available in a suitable form, other materials will also be used on the farm for the control of stored products pests.

One other method of treating small quantities of seeds may be used by farmers when these cannot be stored in insect-proof containers and when facilities for fumigation with carbon bisulphide are not available. This method involves adding a mixture of naphthalene and paradichlorobenzene to the bags of seeds. Both these substances are white, crystalline solids, each with a characteristic odour, which vaporise on exposure to the air. The mixture is both toxic and repellent to insects; it kills those already present in the seed and gives a considerable degree of protection against reinfestation for some months. Equal parts by weight of the two substances are thoroughly mixed and then added to the seed at the rate of one to one and a half pounds to each bushel of the material to be protected. The paradichlorobenzene and naphthalene may either be mixed with the seed or distributed evenly through it in small cloth bags, each containing about one half pound of the mixture. As paradichlorobenzene vaporises much more rapidly than naphthalene, any residual crystals will probably be pure naphthalene. These are available for further use if the cloth bag method of distribution has been employed but the necessary amount of paradichlorobenzene, of course, must be added. Grain treated with this mixture retains a characteristic taint and should not be fed to stock.

Plate 98.
STORE BULLOCKS IN THE YARD AT KINGPAH, WEST MORETON, THE PROPERTY OF MR. J. FAULKNER.



Incidence of Disease in Poultry.

P. RUMBALL, Officer in Charge, Poultry Branch.

THE incidence of disease in the poultry flocks of the State could only be ascertained by a very careful survey, or from an examination of accurate returns furnished by a cross section of those engaged in the industry. Neither has yet been possible.

Many specimens of diseased birds are submitted to the Poultry Branch by farmers for opinions. These specimens are invariably forwarded to the Animal Health Station, Yeerongpilly, for diagnosis or confirmation of diagnosis. The accompanying graph has been prepared from cases dealt with in this manner for the year ending 30th June, 1946. It is not claimed that it represents the incidence of disease within the industry as a whole, but it does give some indication of the disease problems that have to be faced by those farmers situated in areas close to Brisbane, and it is probably fairly representative of the State as a whole.

The graph deals with losses of poultry of all ages. Mortalities from diseases such as pullorum are in the main confined to young chickens and coccidiosis to growing stock from five to eight weeks of age, though serious losses from coccidiosis have come under notice in pullets as old as 12 weeks. The mortalities that were due to nutrition also occurred in poultry up to the age of about 16 weeks. Adult stock also feel the effects of nutritional deficiences. Deficiencies are responsible for production being curtailed, and mortalities also occur. The only case of mortality in adult poultry to which the accompanying graph refers was that of tick fever. Consequently, the graph can be taken as one dealing with poultry that had not, or had just, reached the production stage.

NUTRITIONAL OR DEFICIENCY DISEASES.

The extent of nutritional deficiencies was no doubt largely due to war conditions, and may never again reach the proportions indicated in the graph. In pre-war days there were isolated cases of deficiency disease, and as nutrition plays such an important part in economic production it is as well to indicate what some of these deficiencies were.

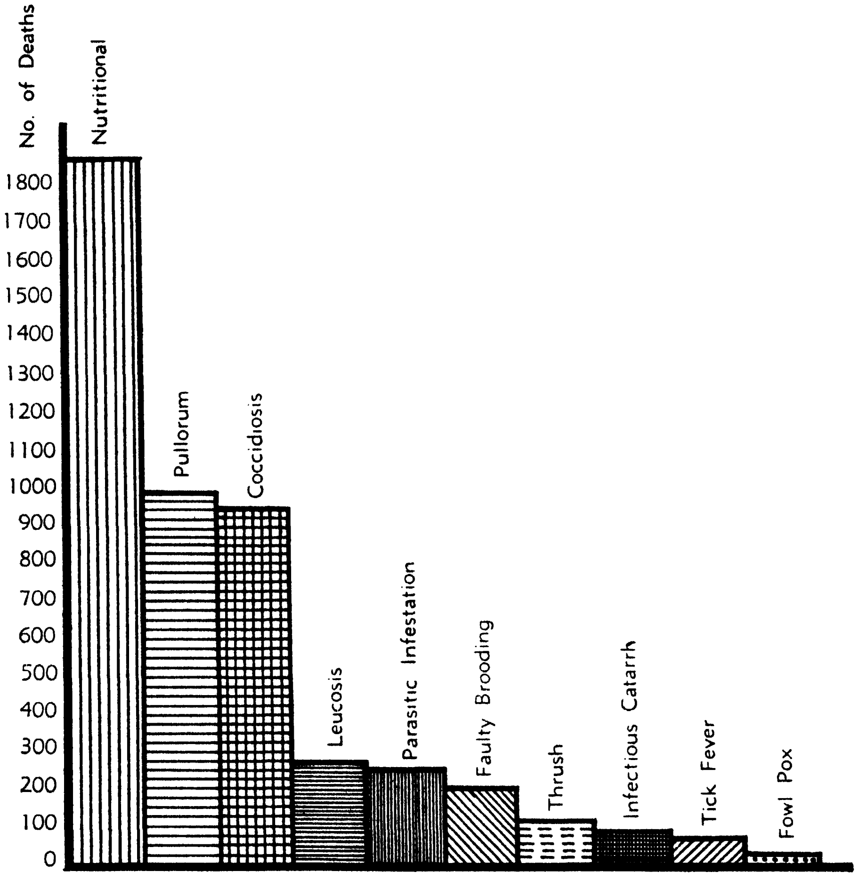


Plate 99.

GRAPH SHOWING NUMBER OF DEATHS FROM VARIOUS DISEASES.—Compiled from details of specimens submitted through the Poultry Branch to the Animal Health Station, Yeerongpilly.

Protein Deficiency.

One deficiency that had never occurred in pre-war days was that of protein, particularly of animal origin. The expansion that had taken place in the poultry industry and the more extensive use of protein of animal origin by other livestock industries made a demand upon meatworks by-products that could not be filled, with the result that a large percentage of poultry mashes had to be used that were deficient in protein and did not contain any protein of animal origin.

Experiment has demonstrated that, for chickens during their early life, mashes should contain from 18 to 20 per cent. of crude protein, and for laying stock about 17 per cent., and that at least 25 per cent. of this protein should be of animal origin. Meat-meal, liver-meal, and milk powders supply this form of protein, and a percentage should be incorporated in all poultry mash mixtures.

Vitamin Deficiency.

Deficiency of Vitamin A was a common disease during the period under review, due to the absence of yellow maize from mashes and grain rations, shortage of green feed, and the inability of farmers to obtain supplies of vitaminised oils. It is a deficiency that occurred in pre-war days, and unless farmers appreciate the necessity for this vitamin it will occur again.

The requirement of vitamin A varies with the class of stock and the purpose for which they are being fed. For instance, it is possible to obtain good production from rations containing a certain level of vitamin A, but almost twice as much of this vitamin is necessary in a ration used for the purpose of feeding fowls producing eggs for hatching. Again, young growing stock require relatively high levels of this vitamin, the amount increasing with age. Deficiency of vitamin A in rations fed to young birds retards their growth, is responsible for poor plumage, and renders them more susceptible to disease, particularly of a catarrhal nature. Farmers are advised to study the accompanying tables showing the requirements of vitamins and vitamin content of various foods, and if the vitamin content of the foodstuffs available is deficient, to make up the deficiency. Vitaminised oils are not all of the one quality. The vitamin content of those available to Queensland farmers may vary from 1,000 to 5,000 units per gramme. Consequently, the amount that should be incorporated in any mixture would vary with the quality of the oil being used. For general purposes 1 per cent. of oil carrying 1,000 units of vitamin A per gramme will supply all the vitamin A necessary in the ration short of vitamin A-rich foodstuffs. Grades of oil carrying a greater number of units should be used proportionately.

Green feed is one of the cheapest forms of vitamin A obtainable, and farmers should endeavour to have a good supply at all times. When green feed is not available they should use vitaminised oil. Young chickens cannot consume sufficient green feed to obtain their requirements, and consequently vitaminised oil should always be used in chicken rations.

Vitamin B2 or riboflavin is another vitamin the shortage of which was responsible for trouble in chickens, bringing about a characteristic "curled toe" condition.

Requirements of Vitamin A and B2 (Riboflavin).—The most recent recommendations with respect to vitamin A and riboflavin requirements per lb. of feed consumed by poultry are as follows:—

Chickens.	Laying and Breeding Hens.
Vitamin A 2,000 Int. units	3,300 Int. units
Riboflavin 1,600 microgms.	1,300 microgms.
Poults.	**Breeding Turkeys.**
Vitamin A 2,500 Int. units	4,000 Int. units
Riboflavin 2,000 microgms.	1,800 microgms.

From the following table it will be possible for poultry raisers to examine the ration fed and correct any apparent weaknesses:—

Food.	Vitamin A per Lb. Inter. Unit.	Vitamin B2 (Riboflavin) Microgrammes per Lb.
Barley	400	400
Maize (Yellow)	3,180	450
Maize (White)	0	450
Cowpeas	1,360	350
Milo	250	400
Oats	80	400
Peanut Meal	250	1,200
Wheat	140	400
Wheat Bran	150	1,000
Wheat Germ Meal	1,900	1,800
Wheat Middlings, near Pollard	120	900
Cottonseed Meal	600	300
Linseed Meal	200	900
Buttermilk, Dried	200	9,000
Cod Liver Oil	340,190	0
Liver Meal	*	18,500
Meat Scrap	*	2,700
Skim Milk, Liquid	15	1,000
Green Lucerne	63,560	2,000
Lucerne Leaf-Meal	32,000	7,000
Cabbage	200	100
Molasses	*	2,000
Kale	181,400	2,240
Lucerne Meal	13,000	5,000

* Information on the vitamin content is lacking.

PULLORUM DISEASE.

This is a disease that is transmitted in the first instance through an infected egg from parent to offspring. It is a disease readily spread during incubation when infected eggs are hatched with others, as the fluff and excreta from the chickens hatched from infected eggs are a most fruitful means of distributing the organism responsible for the disease.

Healthy chickens can contract the disease from infected containers, brooders, and premises, and the disease has been known to be spread from infection on feed sacks. It is a disease readily conveyed from infected adult stock to the brooder house on the feet of the person attending to the general farm practices.

The germ responsible for the disease has been known to maintain its virulence on dry cloth for a period of four months, and in the excreta and litter of a fowl house for up to fourteen months.

Treatment.—There is no treatment for the disease beyond the destruction of those visibly sick and the frequent cleansing and disinfection of brooders, feed and drinking vessels, and brooder pens.

Control.—The disease is one that is readily controlled by eliminating carrier hens from the flock and infection from the premises. Blood testing is the means of detecting the carrier. As the organism will live in the soil and in the fowl pens, poultry as tested should be placed in clean pens that have been disinfected. One test is not sufficient.

To eradicate the disease from the parent stock it is desirable to test all birds four months of age and over at intervals of from four to six weeks until two consecutive tests are conducted and no reactors found. When this stage is reached an annual test should be sufficient. After testing the birds, however, it is essential to make sure that the eggs will not be incubated with eggs from flocks that have not been tested, and to avoid every possible source of infection.

The object of the registration of hatcheries is to reduce the incidence of pullorum disease; although outbreaks have occurred among chickens that are purchased from registered hatcheries, the responsibility for the outbreak does not always rest with the hatchery owner, as he has invariably taken every opportunity to assure that nothing but healthy chickens will be distributed from his hatchery.

Blood Testing.—The services of officers for the purpose of blood testing poultry are available to all poultry raisers.

COCCIDIOSIS.

Coccidiosis is a parasitic infection of poultry caused by the entry into the body of an organism, microscopic in size, belonging to the class "Protozoa"—the lowest form of animal life.

The organism has a specific life-cycle, part of which is spent inside the body of the fowl and the remainder outside. It is only at a certain stage in this cycle that it becomes infective. If the bird swallows material containing coccidia which have not completed their stage of existence outside the body of the bird the organism will not multiply and will be passed through the body. But if it has been outside the body of the bird for more than a day before being swallowed, upon re-entry rapid multiplication frequently takes place with disastrous results.

Two main types of the organism are met with: (1) the caecal type which attacks the caeca or blind gut, frequently giving rise to the condition known as "bloody diarrhoea," and, (2) the intestinal type, which, although not usually as severe as the caecal type, may be just as disastrous.

Coccidiosis occurs mainly in chickens from as early as 3 weeks of age up to 10 weeks. Owing to the rapidity with which the organism develops within the body (one parasite giving rise to up to 4,000 within a very short period of time, most of which are passed out in the droppings to be picked up by other chickens), it can be seen that as time increases the infection becomes proportionately greater. It must be stressed that, as the parasite develops more rapidly in moist litter than in dry, it is of the utmost importance that all litter be kept as dry as possible.

Treatment and Control: The most satisfactory method is, by strict sanitation, to remove the cause. As the organism requires at least 24 hours outside the host to become infective, daily cleaning of the pens and the removal of the droppings is essential until the disease is brought under control. The placing of food in hoppers and the water in vessels where the risk of contamination from droppings is eliminated is essential. Prevent droppings from infected pens being carried to other pens.

Some of the sulpha drugs in more recent years have appeared to have been used with very satisfactory results.

Good nutrition is very necessary, as the disease appears to be more severe when such is not the case. Rations should not be deficient in vitamins A and B. Vitaminized fish-oil should be used for A and milk products for B.

LEUCOSIS.

The general term leucosis embraces a variety of diseases which are caused by the same organism and which are named according to the seat of infection. If paralysis of wing, leg, and/or wing were the only symptoms displayed in this disease, it would be a relatively easy matter for the farmer to determine if it had appeared among his flock. Whereas in many other diseases, for example, coccidiosis, the onset of the disease is sudden and the mortality rate heavy over short periods, in leucosis the daily losses may be small, but the collective annual loss can be ruinous to the commercial farmer.

The seriousness of the disease is best illustrated by citing one or two cases that have come under the notice of the Department in recent months. One Brisbane flock of 1,000 head in a period of eight months was reduced to 472 and upon culling a further 69 showed symptoms of leucosis in its following forms: 6 were blind, 34 had distorted pupils, 10 had typically pearly eyes, 1 had paralysis of the wing, 7 had distended abdomens and 6 were wasting and had diarrhoea.

On another small farm with a pullet population of 310, mortality from February to July was 113. Weekly cullings of birds showing symptoms of leucosis were made on this farm from July to October, resulting in a reduction of the pullet section of the flock by another 113.

Ten years ago this disease was unknown in Queensland but today few flocks are free. These are not isolated cases. Numerous outbreaks have been reported during the last few months, two of which are more severe than the above.

Cause: Considerable research work has been carried out in relation to this disease, and there is little doubt that it is caused by an ultra-microscopic or filter-passing virus which attacks the nervous system and various organs. This wide variety of attack gives many external and internal symptoms which may be overlooked when culling for the disease. The typical external symptoms of leucosis are—

1. Paralysis of legs and/or wings.
2. Grey or pearl eye.
3. Distorted pupil.
4. Anaemia.
5. Wasted appearance.
6. Diarrhoea.

The need for close examination is apparent. A farmer may cull for the very obvious symptoms of leg and/or wing paralysis and miss those less readily discernible.

Internal examination often reveals gross pathological changes in the viscera, for example, enlarged liver and tumours involving the ovary, spleen, kidneys, testes, lungs and the membranes connecting and lining these organs. These tumours are greyish-pink or yellowish in colour, and those visible vary in size from a small nodule to a mass as large as a tennis ball.

Control Measures: There is no known cure for the disease. Treatment of affected birds is useless. A few cases of recovery have been noted, but these birds may still be a potential source of danger as "carriers." The only method of attack is by adopting strict control measures such as—

1. *Culling*: Constant observation for symptoms of leucosis with drastic culling of infected birds is advised.

2. *Rearing of Chickens*: It has been shown that direct or indirect contact of chickens with infected birds is a common method of spread. It is considered by some authorities that the incubation period, that is, the time between infection taking place and symptoms occurring, may vary as widely as from 4 to 5 weeks to a year and that most of the infection takes place during the first four to six weeks of the life of the chicken.

It has been shown that, when chickens have been reared in isolation from possible infection, the incidence from disease has been greatly reduced.

In view of the above it will be seen that the chickens must be reared in isolation from the adults. Clean ground is essential for rearing, and if this is not available intensive methods of rearing should be adopted. Even under these circumstances the brooder house should be well apart from where adult fowls are housed and if possible a separate attendant should look after the chickens until six or eight weeks of age. If such is not practicable the attendant should guard against the introduction of the disease per medium of his boots and clothing.

3. *Breeding Resistant Stock*: Transmission from parent to offspring through the egg is considered by many as a method of spread of this disease and breeding for resistance must play a large part in its control. In breeding practice the use of birds which are infected but show no clinical symptoms will sometimes be made unwittingly. Such a bird will be a probable source of infection. This probability therefore cannot be eliminated from any system of breeding. The incidence of disease can be lessened by breeding from older stock which have proven their resistance to leucosis. The practice of haphazard breeding from pullets cannot be too strongly condemned as the birds have not shown themselves resistant to diseases. Again, the incubation period varying from four to five weeks to a year is another factor which makes breeding from pullets most undesirable. It is obvious, therefore, that the only means available to build up a resistant flock is by progeny testing.

GENERAL.

The other causes of mortality indicated in the graph have been dealt with extensively in previous articles.

The graph does not show the incidence of leucosis to be of a much greater significance than parasitical infestation, and little more than that due to faulty brooding. Mortality from leucosis among poultry does not end with that occurring in growing stock, but persists and continues among the adult. It is for this reason that the importance of taking methods for the controlling of the disease has been stressed.

ANIMAL HEALTH

The Control and Treatment of Mastitis in Dairy Cows.

R. D. CHESTER, Veterinary Officer.

MASTITIS (mammitis) means any inflammatory condition of the udder. It may be caused by a number of different agents, but the common type of infectious mastitis of dairy cattle in Queensland is due to a specific organism, *Streptococcus agalactiae*.

Types of Mastitis.

Mastitis may be classified into three broad types: (*a*) Subclinical, (*b*) Acute, (*c*) Chronic.

Subclinical Cases.—These are, strictly speaking, those cases where the causal organism is present in the udder without causing any change in the appearance of either milk or the udder tissues. However, for all practical purposes they may be regarded as those in which there is no change in the appearance of the udder, but the presence of small clots in the fore-milk may be detected when it is drawn into a strip cup. Thus the regular use of the strip cup is essential to any plan of control.

Strip cup diagnosis should be checked by the submission of properly collected milk samples for laboratory examination.

These cases can be cured by the application of the correct treatment.

Acute Cases.—These are usually indicated by a sudden flare-up of intense inflammation. The onset of an acute attack is frequently a breakdown of a subclinical or chronic case. Occasionally the inflammatory condition in the quarter is associated with fever. The cow may be disinclined to follow the herd; she will not eat. Milk secretion is greatly reduced and the milk may vary in appearance from a thin, watery, blood-tinged fluid to a thick, yellow, custard-like material. Usually there are many clots.

These cases will respond quite well to correct treatment.

Chronic Cases.—These are the result of long-standing infection which has produced udder damage. There is no painful inflammation, though usually there is destruction of glandular tissue, with either shrinkage of the quarter or enlargement due to scar tissue formation (fibrosis). Milk secretion is reduced.

The milk is sometimes thick and custard-like; more often it is apparently normal except for a few clots which will be noticed in the strip cup.

No treatment can replace secretory tissue which has been destroyed. However, the bacteria infecting the quarter can be killed and further fibrosis prevented.

Predisposing Causes of Mastitis.

A thorough understanding of the conditions likely to predispose cattle to infection is essential before the farmer can embark on any programme of control. These predisposing conditions may be grouped under (i) those which lower the resistance of the udder and (ii) those which increase the chances of pathogenic organisms coming in contact with the glandular tissue.

Those conditions lowering the resistance of the udder are:—

(*a*) Bad milking methods.
(*b*) Bad herd management.
(*c*) Unhealthy cattle.
(*d*) Hereditary susceptibility.

Those favouring contamination by bacteria are:—

(*a*) Dirty hand or machine milking.
(*b*) Injury to udders.
(*c*) Contamination of bails and utensils.
(*d*) Dirty udders.
(*e*) Dusty yards.
(*f*) Fly population in bails.

Measures to Prevent the Spread of Disease.

Bearing in mind the predisposing causes set out above, the farmer must try to develop a routine which will overcome these faults.

Milking Routine.—Work in the milking shed should be carried out according to a strict plan. Cows will quickly become accustomed to such a routine and react accordingly. They should work through the bails in a definite order, smoothly and without bustle, but rapidly. A fast, efficient milking technique is of great importance.

Hand-stripping after machine milking should be avoided.

Machines should be run at a maximum pressure of 15 lb. per square inch; less is desirable. High milking machine pressure tends to damage the delicate secretory cells of the udder.

Teat cups should never be left on a cow longer than is necessary. Much damage will result if teat cups are left attached to empty udders.

Most milking machine manufacturers issue instructions concerning the operation of the machine. These instructions should be followed carefully and the pressure gauge checked periodically by a Departmental Dairy Officer.

Preparation of the Udder.—Immediately before applying the teat cup, or commencing hand milking, wash the udder in warm soapy water, drying off excess moisture; then draw a few streams of milk into the strip cup and examine for the presence of abnormalities. Should the milk in the strip cup be normal the teats should be dipped in a tin containing clean fresh chlorine type solution (1 part free chlorine in 800 parts water) and the milking commenced immediately. A delay of more than one minute between preparation of the udder and the commencement of milking is undesirable.

Preparation of Machines.—Immediately prior to each milking run one gallon of chlorine-type disinfectant through each unit. At the completion of each milking the machines must be thoroughly washed by running the following solutions through each unit:

One gallon of cold water.

One gallon of boiling water containing caustic soda (1 tablespoonful for each 4 gallons).

One gallon of boiling water; or, if steam is available, draw steam through each unit.

The teat cups must be disinfected between each cow during the milking process. This can be accomplished by dipping them in clean caustic soda solution followed by chlorine solution immediately prior to attaching to the udder.

Preparation of the Hands.—The hands must be washed between each cow. Wash in warm soapy water and follow with a rinse in chlorine solution.

Stripping.—Do not hand-strip after removing the machines. Inexpert stripping causes considerable injury to the udder.

Drying-off.—Do not dry off by leaving some milk in the udder at each milking; avoid milking once a day. The drying-off process should be quick, the food should be cut down and the cow turned out of the milking herd.

Herd Management.—A great deal of mastitis is avoided by the farmer who takes a little extra care in the management of his herd. Overcrowding in yards and feeding troughs should be avoided. The provision of shelter against extremes of weather and the proper care of sick animals will result in a healthier herd. All chronically diseased animals must be culled from the herd.

Cows known to be susceptible to infection should not be used as breeders. It is known that some strains of cattle are more easily infected than others.

Elimination of Dust.—Dust from yards carries bacteria which will contaminate udders and utensils. Small forcing yards can be swept daily and when water is available they should be hosed.

Control of Flies.—Rails, walls and ceilings about the dairy should be sprayed regularly with a 4 per cent. solution of DDT in order to reduce the fly population.

Management of Infected Cows.—All cows known to be infected must be milked after the healthy cows have passed through the bails.

Infected milk must be drawn into a special container and destroyed. Never milk infected quarters on to a bail floor and never feed milk from infected cows to calves.

Treatment should be carried out immediately a positive diagnosis is made, as early treatment is essential if good results are to be obtained.

Management of Calves.—All calves should be dehorned soon after birth. Dehorned cattle are much more contented in the milking herd and injury to udders is considerably reduced.

Calves should be kept away from the herd and milking yards. Milk from infected cows must never be fed to calves.

Treatment.

New drugs for the treatment of mastitis by udder irrigation have materially increased the chances of curing infected quarters. However, it is essential for satisfactory control that the measures outlined above be practised in conjunction with treatment. Success or failure in handling outbreaks of mastitis will depend upon the thoroughness with which these control measures are carried out.

Treatment by Vaccination.—Although some measure of success has been attained, the use of vaccines is not recommended where udder infusion can be practised.

Treatment by Udder Infusion.—This method has proved very effective. Many different drugs have given promising results but sluphanilamide and penicillin have been most efficient under experimental conditions.

Sulphanilamide in Oil.—A preparation of this type has been placed on the Queensland market under the name of "Europa." A special injector is also available. The preparation has the advantage of being non-irritant and therefore it may be allowed to remain in the udder after injection.

Treatment should be carried out immediately mastitis is diagnosed. The quarter is completely stripped out and the udder washed with hypochlorite solution (1 part free chlorine in 800 parts of water). A sterile teat syphon is then inserted into the quarter by way of the teat canal. The teat syphon is connected with the injector by a short piece of rubber tubing and from 30 to 60 c.c. (according to capacity of udder) of the preparation injected. Three injections at intervals of 24 hours are necessary.

Recovery should be complete after one week. If recovery does not take place it is advisable to submit milk samples for laboratory examination so that the type of infection can be checked.

Dry cows can be treated in exactly the same way as those in milk.

It is most important that all apparatus be sterilized by boiling immediately before commencing treatment. Although more than one quarter can be treated at the one time without sterilizing the injector, it is absolutely essential that a fresh sterile teat siphon be used for each individual quarter.

It is advisable to consult your Veterinary Officer or Stock Inspector and have him demonstrate this method before undertaking routine treatment.

Penicillin.—This drug is now available for the treatment of mastitis; like sulphanilamide in oil it is non-irritant and is therefore left in the udder after injection. Its efficiency depends on the type of organism responsible for the infection and the degree of udder damage present at the time of treatment.

The penicillin is sold as a yellow solid in ampoules containing 100,000 units. Each is sufficient for four treatments. The preparation is only stable if kept refrigerated.

To make a solution for treatment take 10 c.c. of boiled sterile water in a boiled syringe and inject it through the rubber cap of the ampoule. The penicillin, which is very soluble, quickly dissolves. It may then be withdrawn into the syringe and transferred to 400 c.c. of boiled sterile water in a graduated bottle from which it can be gravitated into the quarter. Each 100 c.c. of the solution so prepared contains 25,000 units of penicillin, which is sufficient for a single treatment.

Once dissolved in water penicillin must be used immediately.

The apparatus for injection consists of a bottle to contain 400 c.c. graduated at each 100 c.c., a rubber stopper through which two glass tubes are passed and a length of rubber tubing.

The quarter is stripped out and the udder washed as for sulphanilamide treatment and the sterile teat syphon inserted. The teat syphon is then connected with the bottle containing penicillin solution, which is held upside down at a height above the udder and 100 c.c. of solution is gravitated into the quarter.

The whole apparatus must be sterilized by boiling after each 400 c.c. of solution is used and a separate sterile teat syphon must be used for each quarter.

Treatment is repeated 24 and 48 hours after the initial treatment.

Cases which do not respond should be checked up by sending milk samples to the laboratory.

Farmers wishing to use penicillin should consult their Veterinary Officer or Stock Inspector. The use of penicillin is controlled, and is only available to veterinarians subject to a certificate stating that the penicillin is required for the treatment of mastitis in cattle.

Collection of Milk Samples.

For complete and satisfactory examination of milk samples it is essential that they are collected correctly. Following is the method recommended by this Department:—

(1) The udder and teats should be thoroughly washed with a solution of hypochlorite (1 part chlorine in 800 parts water) and excess disinfectant allowed to drain off.

(2) The ends of the teats should be vigorously swabbed with methylated spirit.

(3) Discard the first jet of milk.

(4) Draw straight into a sterile bottle held at an angle to exclude falling hair and dust.

(5) Cork or cap immediately after taking sample.

These additional points should also be observed:—

(1) Only samples from individual quarters should be submitted.

(2) If more than one quarter is sampled, the teats must be swabbed in the correct sequence, namely, left fore, left hind, right hind, right fore and the samples drawn off in the reverse order.

(3) Do not collect specimens into bottles previously filled with disinfectant.

(4) Sterile bottles will be supplied free by the Animal Health Station, Yeerongpilly, if requested. If the bottle cannot be obtained from Yeerongpilly, a clean bottle should be sterilized by either of two methods:—

(*a*) Put the lid (or cork) and bottle separately into a saucepan of water and boil for 15 minutes. When cool, shake off excess water and assemble. Do not touch the inside of the bottle or the lid, or open the bottle until it is used.

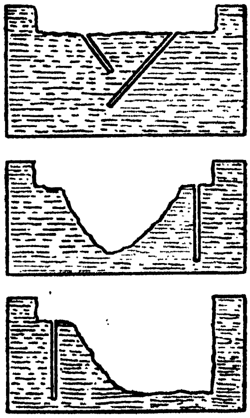
(*b*) Cork or cap bottle and heat in a hot oven for one hour. Do not open until used.

(5) Label all samples with:—

(*a*) Name (or number) of the cow and the quarter from which the milk was taken.

(*b*) Name and address of person submitting specimen.

USEFUL HINTS ON SINKING WELLS.



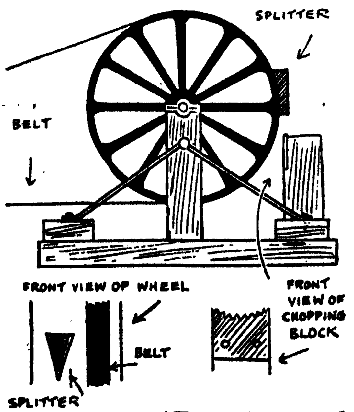
These few notes are based on the successful experience of one man sinking a 5 x 3 well which had reached solid rock. In such cases, it is usually hard to keep the corners straight, and to know how the holes should be drilled to obtain best results.

Two holes were put down, as shown in figure 1, one being about 18 in. in depth and the other 2 ft. 6 in., the charge in the short hole being fired first.

After the second charge has been fired, there should be a conical shaped hole as shown in fig. 2 and the next task will be to put down a hole parallel with the wall at one side, so that it leaves a "bench" which is afterwards removed by another parallel charge.

These are, of course, only general instructions, as the type of country makes it hard to apply any hard and fast rule. Naturally the charge will leave the hole in a rough condition, and the corners will have to be made, and the walls trimmed. However, by working a series of "benches," it should be possible to accomplish the task with little difficulty.

A HOME-MADE WOOD SPLITTER.



This useful type wood splitter devised by one man has done good service and saved much time and labour. He got a pulley from an elevator which had a 12 in. face. To the rim on one side is riveted a wedge, faced with two leaves of an old car spring, brought to a sharp edge in front.

The splitting block is made as shown, with a notched iron plate The belt from a 3½ h.p. engine runs on the other side of the wheel. The stick of wood is held on its side and pushed in so that the wedge shaped splitter comes down on it. If the splitter sticks, it simply throws the belt and no harm is done. As fast as a man can feed the blocks to the machine it will split them. The idea itself might be of value to many even if another type of wheel has to be used.

—*From "Handy Farm and Home Devices and How to Make Them."*
(*J. V. Bartlett for War Blinded Association, Adelaide, S.A.*), 1946.

Submission of Specimens when Poisoning is Suspected.

W. R. WINKS, Chemist (Toxicologist).

SUDDEN deaths often occur among animals in good health and poisoning is naturally suspected. The question then arises as to what material should be submitted for chemical analysis and how it should be selected.

The nature of the specimen will depend to some extent on the symptoms preceding death and on the general history of the case.

Specimens from Cattle, Sheep and Goats.

Cattle, sheep and goats are ruminants—that is, cud-chewers—and have what are commonly called four stomachs. The first and second stomachs are mainly food reservoirs, and the main digestive action taking place in them is bacterial fermentation. The fourth stomach is the true stomach.

In the case of poisons taken by mouth, after a quantity sufficient to cause death has been absorbed, most of the remainder will be found in the first and second stomachs. As animals which have died suddenly have usually consumed quantities of poisons far in excess of the fatal dose, comparatively large amounts are found in the first stomach.

The remains of poisons actually digested or being digested are found chiefly in the fourth stomach.

It is therefore necessary in the case of suspected poisoning of ruminants to submit specimens of the contents of the first stomach (or paunch) and also of the fourth stomach.

These specimens must be kept in separate containers and distinctly labelled with the nature of the specimen and the name and address of the owner.

The amount of specimen to be sent is also of importance. The paunch of cattle usually contains between 50 and 60 pounds of material and it is obviously not advisable to send this amount. The paunch contents should be thoroughly mixed and about 2 pounds taken as a sample. The whole of the contents of the fourth stomach should constitute one sample. If animals have had access to materials containing arsenic, such as dipping fluids, or pastures poisoned with arsenical weed-killers, confirmation of this fact is all that is necessary, and the specimens suggested above are sufficient.

Poison residues, however, are stored in the liver and kidney and in the case of death after a somewhat prolonged illness about one pound of liver and at least one kidney should be selected and each placed in a separate container suitably labelled.

In the case of poison absorbed through the skin, such as from an over-strong dip, the liver and kidneys should always constitute part of the specimen, as absorbed poisons are seldom found in any of the stomachs. It is not necessary to wait for the death of an animal, as

traces of some poisons, particularly arsenic, can readily be picked up in the dung, a sample taken directly from the lower bowel with the hand being preferable to one that has been passed on to the ground.

As an antidote for arsenical poisoning, the common photographic hypo (2 ozs. as a drench repeated in 3-4 hours) is quite harmless, and no time should be lost in drenching the animal. A specimen of the dung could be submitted to confirm the presence of the suspected poison.

Horses, Pigs and Other Animals.

The distribution of poison in the organs of animals which have only one stomach is somewhat different from that in ruminants and different specimens are needed for examination.

In the case of horses, about two pounds of the well-mixed stomach contents is sufficient for chemical examination, and where the symptoms indicate chronic poisoning portion of the liver and the whole of one kidney should be sent.

For pigs, about two pounds of the stomach content will suffice for analytical purposes, with liver and kidney required if the illness has been prolonged.

The whole stomach of a dog should be taken, as well as any vomit which may be available.

For fowls, the crop and gizzard in separate containers are usually sufficient. If a number of fowls have died several crops and gizzards can be used as samples, the crops being kept together in one bottle and the gizzards in another.

Preservatives.

Most animals begin to decay and offensive odours arise soon after death. To ensure the arrival of the specimen in the least objectionable condition, the sender is often tempted to add preservative.

Preservatives of any kind add to the difficulties of analysis and may themselves contain traces of poisons and so should be used as little as possible.

No preservative is necessary in the case of stomach content of cattle, sheep, or goats (that is, grass or plant-eating animals), and if the containers are not overfilled preservatives should not be necessary for pig or dog stomachs or bird specimens.

If liver and kidney specimens have to be sent any distance, a small quantity of coarse salt may be added but, if added, a small packet of the same salt should accompany the specimen.

Formalin should never be used, as it destroys or partially destroys some poisons and is most objectionable to the analyst.

Methylated spirits would be the best preservative, but the materials used for denaturing it introduce complications in the analysis, and it therefore should not be used.

Additional Specimens.

Any substance or material suspected of causing the death of an animal should also be sent; but if the animal has died, specimens from the animal should always come with the suspected substance. A piece

of meat containing strychnine does not necessarily indicate that the animal died of strychnine poisoning. The presence of strychnine in the stomach of the animal and in the meat would, however, be strong presumptive evidence of death from this cause.

All specimens should be forwarded to the Director, Animal Health Station, Yeerongpilly. A letter, also addressed to the Director, should be sent at the same time as the specimens. This should give particulars of number and class of stock affected, number sick, number dead, course of the disease, post mortem, pasture, poison suspected and why, and specimens submitted.

Suspected Plants.

Many plants dangerous to stock grow abundantly in Queensland, but their active principle (i.e., the poison) has not yet been isolated. In these cases it is not possible for the analyst to verify plant poisoning as the cause of death. However, in all cases of suspected poisoning by plants, specimens of the plants should be sent along with the samples for identification. If possible plants or pieces of plant with either flowers or fruit or both should be selected as botanical specimens.

Summary.

For ruminants: (1) Send about 2 lb. well-mixed paunch content and the whole of fourth stomach content; (2) send liver and kidney in case of protracted illness.

For horses: Send about 2 lb. well-mixed stomach content, and liver and kidney in protracted sickness.

For dogs: Stomach content, also vomit, and liver and kidney after protracted sickness.

For fowls and other birds. Send crop and gizzard.

Specimens should be in separate containers and distinctly labelled. A covering letter should be despatched along with the specimens. Containers should be scrupulously clean. Do not use any tin or bottle labelled "POISON," even if certain that it has been thoroughly cleaned.

Do not use preservative except in special cases.

A further article covering the selection of specimens where a lawsuit is probable will appear later.

It must be recognised that the analyst can only analyse the specimen he receives. See that it is representative.

Agricultural Chemistry

Why Cattle Chew Bones.

R. H. MATHAMS, Analyst, Chemical Laboratory.

BONE chewing or depraved appetite (pica) in cattle is the result of an instinctive effort by the beast to replace certain elements deficient in its diet. These are usually mineral substances and may be (*a*) phosphorus (phosphate), (*b*) calcium (lime), (*c*) a combination of both, or (*d*) certain "trace" elements, e.g., iron, copper and cobalt.

It should not be overlooked, however, that a heavy infestation of intestinal parasites—such as worms—may also cause similar symptoms. The immediate effect of such a heavy infestation is to induce malnutrition and digestive upsets which may, in their turn, result in a depraved appetite.

Phosphate and lime deficiencies are, more often than not, companion deficiencies and hence their cause and treatment will be discussed together.

Phosphate Deficiency.

This is common in many parts of coastal Queensland and the Peninsula where natural pastures represent virtually the whole of the grazing. Deficiency in the phosphate content of the soil is reflected in phosphate-deficient pastures.

Symptoms.

Affected cattle chew and eat bones and other foreign material, such as wood, hair, putrid flesh, earth, stones, leather and even tin cans. As the deficiency progresses they exhibit loss of appetite, emaciation, lowered efficiency, weak bones, stiff joints, spastic gait ("wobbles"), decreased milk flow, small calf drop and a general unthrifty and haggard appearance.

Analysis of blood from affected animals shows a marked decrease in inorganic phosphate. Fodder analysis also shows a low phosphate figure.

Calcium (Lime) Deficiency.

Uncomplicated calcium deficiency is rather rare, especially when cattle are receiving liberal amounts of roughage, but may occur in dairy cattle during heavy continuous milk production. This is particularly the case with cattle in which a large proportion of the ration consists of industrial waste products, e.g. brewers' grain or milling by-products.

Symptoms.

Frequent bone fractures, lowered milk production and incapacity to reproduce through failure of the fœtus to develop are the most apparent effects. The condition is difficult to determine in its early stages as the animal remains in generally good condition—there is none of the lethargy and stiffness associated with phosphate deficiency.

Because the animal draws readily on its bones to keep up the calcium content of its blood, an analysis of the blood will often show, in adult animals, only a slight decrease and sometimes even an increase. Younger animals are more prone to calcium deficiency and blood analysis will show a greater decrease.

Cause of Ailments.

The bones of the body are the storehouses in which are kept reserve supplies of lime and phosphate. Normally, any demand by the body over and above that provided by the food can be met, but when a decreased food intake is prolonged the demand becomes too great and, in addition to the other symptoms described above, the bone structure is affected. Phosphate deficiency is much more prevalent than lime deficiency, although oftentimes the two are combined.

Danger Points in Lime-Prosphate Deficiency.

In growth, when the bones are being formed and the young body developing, there is a heavy demand for phosphorus and calcium minerals and a deficiency can cause rickets, stunted growth, and the development of a "runt" or "poor doer."

Dairy cows, in the first months of a heavy lactation, excrete through the milk more calcium and phosphate than they obtain in their fodder and, therefore, draw on their bone structure for the necessary minerals. These need to be replaced later when milk production declines or during the succeeding "dry" season.

Drought and—more frequently—overstocking can so reduce the food intake that stock become mineral-starved with consequent obvious results.

It should always be remembered that heavy-in-calf and lactating cows and young animals are much more susceptible than dry stock, males or mature animals, for the obvious reason that they are in greater need of the minerals.

Prevention and Treatment of Lime-Phosphate Deficiencies.

The obvious answer to the problem is to supply the minerals for which the bone-chewer craves. This can be done in several ways:—(*a*) by introducing mineral-rich foods into the animal's diet; (*b*) by supplementing the normal diet with lime- and phosphate-rich mineral supplements; and (*c*) by increasing the mineral content of the pasture by fertilizing the soil on which it is grown.

The following foods provide a selection of phosphate-rich supplements which could be added to the diet—legume hays and chaff (e.g. lucerne), bran, animal protein concentrate (such as meatmeal or even meatworks fertilizer), seed cakes (such as linseed, cottonseed and peanut) and cereal grains. Of these, the legumes and meatmeal are also rich in lime.

Mineral supplements should be finely powdered so as to be quickly and easily utilized by the body and made palatable by mixing with salt as a lick, or mixed with the supplementary feed.

Sterilized bone meal, degelatinated bone and dicalcium phosphate are the more common lime phosphate supplements. Rock phosphate or "super," though reasonable sources of lime and phosphate, may be dangerous as they often contain sufficient fluoride or arsenic to cause ill effects and they are not readily eaten by stock.

Such finely powdered mixtures (especially bone meal), if fed in the open paddock, are liable to contamination, to spoilage from rain or heavy dew, and to wastage from the wind. It is therefore better to put the trough under cover and, if necessary, bind the mixture together with molasses diluted at the rate of one pint to one gallon of water. One gallon of this liquid will bind about 50 lb. of lick.

The topdressing of pasture depends on a number of factors—the soil type, the topography, climate, composition of the soil and the type of pasture grown. No general advice can, therefore, be safely given. Help should therefore be sought from the nearest Agricultural Adviser before commencing any pasture improvement.

Milking cows, to be kept at efficient production, need special attention. In many parts of the coastal dairying areas of Queensland the soil has been shown to be mineral deficient. Cattle should therefore be provided with a mineral supplement, e.g. a mixture of equal parts of common salt and sterilized bone meal, added to the fodder at the rate of 1–2 lb. per 100 lb. of fodder. For grazing animals a similar mixture used as a lick should be readily available. Where the water is brackish the lick may have the salt reduced or even eliminated and a small amount of cereal meal used to make it attractive.

For straight-out calcium deficiency, powdered limestone or powdered shell, such as oystershell, is the cheapest source of lime. It may be fed as a lick if some appetizer is added.

The practice of feeding smashed "green" bones is not recommended, as a sharp sliver of bone may cause puncture which would result in internal hæmorrhage. Further, the organism which causes botulism may have infected the bones or the meat scraps on them.

Deficiency of "Trace" Minerals.

This is also known as nutritional anaemia or anaemia, in America as "salt lick," in Scotland, as "pine," in New Zealand, as "bush sickness," in Australia as "wasting disease" and under various local names in the highlands of South America and Central Africa and in Asia.

Symptoms.

Cattle may show many and varied symptoms, depending on which trace mineral or combination of minerals is deficient. Depraved appetite is sometimes, but not always, associated with the more common signs of loss of appetite, weakness, diarrhoea or severe constipation, listlessness, a rough coat of hair and a scaly skin. Young cattle fail to grow, sexual maturity is delayed, and reproduction and lactation are unsatisfactory. Occasionally (but especially in copper deficiency) the hair coat of the animals becomes bleached.

The blood becomes very pale and deficiencies may be determined by chemical analysis and a microscopic examination of the blood. If death occurs, analysis of liver and spleen are also useful. It must be remembered, however, that only minute amounts of these trace minerals are present in the blood—one ounce of it will contain about one-millionth part of an ounce of copper—and so extreme care is needed, when taking the samples, to ensure that there is no contamination with metal instruments which may contain copper.

Cause.

A lack of these trace minerals in the diet causes, eventually, a reduction in the size of the red cells in the blood plus too little haemoglobin (the red colouring matter in the blood). This causes a lessening in the efficiency of the blood in its normal work with resultant ill effects to the body.

Danger Points.

Young cattle over six months and heifers calving for the first time seem to be more susceptible than others to nutritional anaemia, though cattle of all ages and both sexes may be affected if being run on country that is deficient in all or any of these trace minerals.

Prevention and Treatment.

Similar recommendations to those given for lime and phosphate are here again generally applicable. Amounts needed for treatment are so small, however, that perhaps the best method is the addition of small amounts of the minerals to either a salt lick or to the drinking water. A suitable lick can be made of a mixture of 100 lb. common salt, 25 lb. red oxide of iron, 1 lb. of powdered copper sulphate (bluestone) and 1 oz. of cobalt nitrate or sulphate. Twenty pounds of this mixture will supply an adequate amount of these trace elements to 50 head of cattle for one month. The cobalt salt can be evenly spread through the mass by dissolving it in water and spraying it over the mixture with a fly sprayer.

Parasitic Infection.

A heavy infestation of worms can have the same effect as slow starvation and hence cause many of the symptoms already described. Unthriftiness, a dull and rough coat, a haggard or "tucked-up" appearance and some interference with normal digestion shown by diarrhoea or constipation are the usual symptoms.

Control measures and treatment for such infestations have been the subject of previous articles in this Journal and any detailed explanation would be out of place here. In general, a specific drench for the kind of worm found is administered, and strict decontamination and rotation of paddocks practised. This is followed by a well-balanced ration to bring the animal back to good health and efficient production.

Conclusion.

Where cases of bone-chewing or depraved appetite are noted, it is well to examine the cattle for companion symptoms. If worms are suspected, carry out the necessary drenching and routine control measures. If mineral deficiency is suspected then an analysis of (i) the food, (ii) the soil on which the pasture is grown and (iii) blood samples, and samples of liver and spleen, if possible, will generally indicate what mineral (or minerals) is lacking and hence what supplement to use. Remember that samples for analysis should be carefully taken so as to be truly representative, and should be well packed and quickly consigned to the laboratory so that a reasonably accurate result may be obtained. Remember also that the provision of a lick or the supplementation of a ration are, though effective, not the *only* answers. Pasture improvement, where at all possible, is perhaps the best answer to this problem.

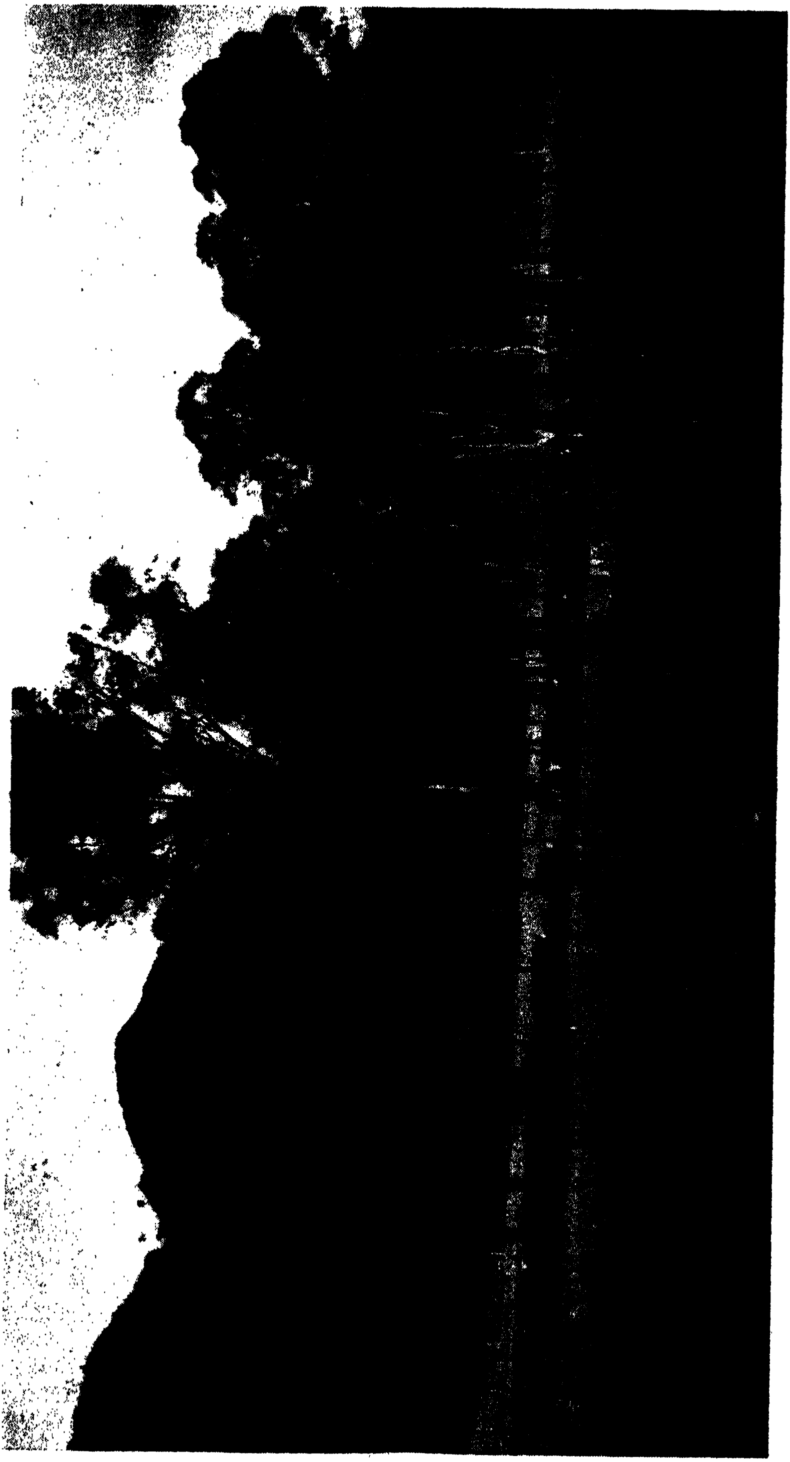


Plate 100.

A CATTLE CAMP ON KINGPAH, WEST MORETON—The property of Mr. J. Faulkner.

MARKETING

Crop Forecasting Service.

C. H. DEFRIES.

THREE hundred thousand farmers in the United States of America regularly keep their Department of Agriculture informed as to the production prospects of crops and livestock products in their particular localities. These reports from honorary crop correspondents, as they are called, form the basis of surveys by the United States Department of Agriculture which give comprehensive information as to acreage planted, growing conditions, and anticipated production of crops. These surveys are issued at frequent intervals and provide valuable information which can be used by primary producers to plan the operations on their farms.

These forecasts are also distributed to machinery and fertilizer firms, transport and storage agencies, banks, and firms which sell farmers' requirements such as produce merchants, grain brokers, seedsmen, case mills, bag manufacturers, and so on, all of whom find forecasts of this nature of great value in the organization of their business.

A similar service is provided in New South Wales and reports are regularly issued by the Department of Agriculture in that State giving a detailed analysis of growing conditions of various crops in all of the important production centres of the State.

The need for a similar system in Queensland has long been recognized and provision was made for the inauguration of a crop forecasting service when the Department was reorganised two years ago. The service will be administered by the Marketing Division of the Department, and now that the pressure of work arising from wartime controls is easing, it is proposed to establish a limited service which it is expected will be extended as time goes on.

The initial objective of a crop forecasting service in this State would be to provide in respect of important agricultural crops authoritative information which would include—

1. Details of the acreage farmers intend to plant to the particular crop.
2. As soon as practicable after planting, details of the acreage sown and the planting conditions.
3. Information concerning the progress of the crop and an estimate of the expected production therefrom.

Great reliance will be placed on honorary crop correspondents and field officers of the Department of Agriculture and Stock for the information necessary to compile these reports. The co-operation will be sought of Commodity Marketing Boards set up under *"The Primary*

Producers' Organisation and Marketing Acts, 1926 *to* 1945," and also of any other agencies which may be in a position to advise of crop conditions.

As already mentioned, an important feature of this service will be the reports to be submitted by honorary crop correspondents. In the main, these will be practical farmers who have been recommended by local field officers of the Department of Agriculture. At appropriate times during the growing period of the crop to be dealt with, a form will be posted to correspondents which, when completed, will provide the information needed for the compilation of the crop forecast. A stamped addressed envelope will be provided in each case, so that correspondents shall not be put to any expense in this regard. The details required will primarily be concerned with information such as the changes in acreage on the correspondent's own farm and in his immediate locality; estimates of the yield per acre on his farm and in his immediate locality; together with brief comments on weather conditions, planting conditions, growing conditions, the abandonment of crops, or the diversion of crops to other uses.

One very important consideration which cannot be neglected in forecasting is the possibility of sudden changes which may occur in crop prospects as the result of hail, frost, flood, or other natural phenomena, which may change the picture overnight. Continued drought or heat at critical periods may also render forecasting difficult. However, every effort will be made to provide an up-to-date picture of crop conditions as at the time of the issue of the report; and correspondents will be asked to extend their co-operation to the end that in the event of any untoward influences being encountered early information as to the effect on crops will be available.

It is proposed to commence this service with the autumn potato crop and action has been taken to appoint, in the main potato-growing districts, crop correspondents who have been asked to report as already outlined.

FARMERS MADE MONEY.

American farmers are sitting behind a lot of money to-day—money made during the war, Mr. A. K. Gardiner, Progressive Farmer Competition winner, said on his return to Sydney from his U.S.A. tour. Many of these men, he added, were anxious to visit Australia instead of Europe, which was too unsettled.

As an instance of the steep rise in land values, Mr. Gardiner cited the case of a government official whom he met. Just before the war this man gave 10,000 dollars for a house and 6-acre block at San Matao. Recently he refused 40,000 dollars for the property, but leased it for 5,000 dollars per year instead.

Throughout the States the price of farm land was so steep that there was practically no soldier settlement, he said. The Government, too, did not appear anxious to encourage soldier settlement as the risk of over production was very great.

Incidentally, butter was anything up to 5s. per lb. in America when Mr. Gardiner was there.

Droves of U.S.A. people were ready to take tourist trips to Australia since returning servicemen had told them about this country, Mr. Gardiner continued.

But, he added, Australia would need to provide much better accommodation than exists to-day, for the American, he said, was used to the best service in the world and was prepared to pay for it. Money spent in this direction was no consideration, but the American tourist expected value in return, and would spend money like water to get it.

Marketing and Economic Notes for April.

Empire Preference.

To meet a prevailing demand, stimulated by the current International Trade Conference at Geneva, for information concerning Empire Preferences and the influence they have had upon the export trade in Queensland's rural products, a brochure has been prepared by Officers of the Division of Marketing, and will shortly be made available for distribution.

Farm Machinery.

Of particular interest to wheat and cane farmers and others in Queensland who depend to a large degree on mechanisation is a report in the November 1946 edition of "The Agricultural Situation" issued by the United States' Department of Agriculture. This emphasises the acceleration of the trend towards mechanisation occasioned by the war and indicates that the production of farm machinery has not yet caught up with the demand by American farmers. Moreover, prices continue to rise, and continued material shortages are expected to influence adversely the volume of production this year. It is stated that the one and a-quarter million tractors on farms in 1940 will probably increase to over two and a-half million in 1947. It is therefore apparent that farmers here can expect no substantial relief from the United States until something approaching equilibrium between demand and supply is attained in that country.

Production Trends.

Dairy cattle are in thriving condition and prospects for the winter appear bright, as paddock feed is plentiful and large areas of green fodder crops are available.

With favourable conditions the maize crop on the Atherton Tableland may reach 19,000 tons. The South Burnett district has experienced favourable conditions, and yields of late crops will be satisfactory.

It is estimated that 1,000,000 bushels of grain sorghum are still to be harvested from the Darling Downs. Good yields from late planted crops in the South Burnett are now assured.

A good rate of growth was maintained throughout all sugar areas. Crop prospects are good in the Lower Burdekin, but only fair at Mackay and in the far northern district. The overall yield in the southern districts should be much better than last year.

Tobacco curing operations are almost complete in the South-west and grading is in progress on all farms. Grading of cured leaf from irrigated crops in North Queensland has been completed.

STORAGE OF PUMPKINS.

Pumpkins for storage should be selected preferably from early-sown crops as they have longer to ripen off than those from the later crops. The fruit should not be harvested until thoroughly ripe, as immature specimens tend to develop mould. Maturity is indicated when it is difficult to pierce the rind with the thumbnail. The pumpkin should then be cut from the vine, leaving several inches of the stem attached to the fruit. Care should be taken to avoid bruising the skin, as injuries of any type permit the entry of organism causing decay. Prior to storing, pumpkins should be cured for a period of two weeks. This can be done by placing the fruit in the sun, or, in the cooler months, by placing it in the sun on an iron roof. The best curing temperature is 80-85 degrees.

The process of curing completes ripening and heals mechanical injury which may have occurred during harvesting. Pumpkins free from frost injury should then be stored in a dry airy place, preferably on slatted shelves, and they should be examined regularly for any signs of decay.

GENERAL NOTES

Staff Changes and Appointments.

Noel Henry Adams, Q.D.A., Assistant Instructor in Agronomy at the Queensland Agricultural High School and College, Gatton, and Jim Hart, Q.D.A, Field Assistant, Regional Experiment Station, Biloela, have been appointed Advisers, Agriculture Branch, in the Division of Plant Industry, Department of Agriculture and Stock.

The designation of the position of Assistant Experimentalist, Regional Experiment Station, Biloela, has been changed to that of Experimentalist, and the redesignated and reclassified position has been assigned to Roy Wesley George, Q.D.A., the present occupant.

Rickard Brock de Lisle, Dip. Agr. (Dookie) has been appointed Adviser on probation, Sheep and Wool Branch, Department of Agriculture and Stock, Emerald.

Wild Life Preservation.

In pursuance of the provisions of *The Fauna Protection Act of* 1937, an Order in Council has been issued declaring Lilliesmere Lagoon, Ayr, to be a sanctuary under and for the purposes of the abovementioned Act.

Quarantine Area—Maroochy Shire.

The disease brown spot of Emperor mandarins has been found to occur in the Maroochy Shire and, because of the serious nature of this disease, a proclamation has been issued under *The Diseases in Plants Acts*, 1929 *to* 1937, proclaiming the whole shire a quarantine area in respect of all parts of Emperor trees, other than the fruit.

Open Season for Duck and Quail.

An Order in Council has been issued under *The Fauna Protection Act of* 1937 to make provision for an open season for duck (except Burdekin Duck) and quail in Queensland. The effect of this Order in Council is to fix the open season for duck (except Burdekin Duck) and quail in Southern Queensland from 1st June, 1947, to 31st August, 1947, both inclusive, and in Central and Northern Queensland from 1st July, 1947, to 30th September, 1947, both inclusive.

The attention of shooters is drawn to an Order in Council which prescribes that twenty (20) duck and twenty-five (25) quail are the maximum numbers, respectively, which any one person may take during a period of twenty-four hours.

Plywood and Veneer Boards.

Orders in Council have been issued extending the operations of the Plywood and Veneer Marketing Board and the Northern Plywood and Veneer Marketing Board from 3rd May, 1947, to 2nd May, 1950. Members of the Boards appointed for that term are:—

The Plywood and Veneer Marketing Board.—James Fairlie Brett; Robert Halliwell Bentley; Marcus John Gordon Brims; Eric Stanley Hancock; Percival Charles Pascoe; Harold Henry Thomas Greentree; George Ernest Newman; Frederick James Thompson, and Henry Roy Hancock.

The Northern Plywood and Veneer Marketing Board.—James Fairlie Brett; George Douglas Gummow; Charles Raff Paterson; and William Patterson.

Honey Board.

The counting of votes at the referendum on the question of the extension of the operations of the Honey Marketing Board for a further three years from 9th March, 1947, resulted as follows:—

For the extension	144
Against the extension	73

Rural Topics

No Substitute for Wool.

For a generation or more science has gone flat out trying to find a satisfactory substitute for wool, but the quest has been unsuccessful. Here is what the Chief of the Textile Station, Research and Development Branch, Office of the Quartermaster-General, United States of America (Colonel S. J. Kennedy), told a Senate Committee (U.S.A.) recently:—

"At the beginning of the war we were much concerned over the prospects for the wool industry. There was a possibility that sufficient wool would not be available to meet military requirements.

"Considerable research was undertaken to find out if there were other materials which could be used by the Army in place of wool. However, no important change was made in the use of wool over-all for military clothing."

Japanese Machines Idle.

In a broadcast heard from Radio Tokio by the Department of Information, interesting figures relating to the present position of Japan's woollen manufacturing industry were given.

The statement was presumably issued with the approval of the American authorities.

It was stated that woollen manufacturing equipment actually in operation comprised 87,000 spindles for combed wool textiles and 245 carding machines for spun yarn textiles.

This low figure, it was pointed out, was due entirely to the prevailing coal shortage in Japan, for the total equipment in a usable condition reached the figure of 295,000 spindles for combed wool textiles and 373 carding machines for spun wool textiles.

In addition, there were 127,272 spindles for combed wool and 57 carding machines and 10,212 weaving machines for spun yarn textiles in Japan, all of which were out of action because of lack of spare parts and other material.

The report gave production figures for June last at 2,671,000 lb. of yarn and 5,337,920 (figure uncertain) yards of woollen fabric.

However, if there was sufficient coal to enable all available 295,000 spindles and 373 carding machines to operate 12 hours daily, these machines could, it was estimated, cope with 480,000 bales of wool annually.

Prevention of Sickness in Stock.

There is too often a tendency on the part of the farmer and stockowner to regard veterinary science as only capable of coming to his aid when stock are already sick, forgetting that the most valuable part of veterinary advice is that dealing with prevention. The treatment of sick stock is of value, infrequently perhaps, but good hygiene—the correct application, that is, of those systems of stabling, housing, grazing, sheltering, grooming, clipping, clothing, feeding and watering which are most conducive to the good health and economic efficiency of the animals—is of value at all times.

"From Quenchless Springs."

A new book of poems, *From Quenchless Springs*, by Emily Bulcock, breathes the spirit of the Queensland countryside. The title poem is a gem and others have the beauty of thought and expression characteristic of the work of a gifted Australian writer. Among the titles are "The Lost Company" (dedicated to Australian Prisoners of War, Far East), "The Test," "The Return," "The March of the 9th Brigade," "Youth Immortal" (a tribute to the R.A.A.F.), "Curramundi—Caloundra," and "Lake Barrine." *From Quenchless Springs* is an excellent gift book. Our copy is from the author, by whom the book is distributed from her home, "Ungula," Wight Street, Milton, Brisbane. (Price, 2s. 6d. posted.)

GADGETS AND WRINKLES

Hints on Painting.

Everyone about the farm and home should be able to do a little occasional painting, and do it skilfully. The following simple hints have been gathered from practical experience, and from cabinetmakers of the old school; all of them are tried and tested. They should help the amateur.

Turpentine will soften putty as quickly as oil. To keep putty moist and pliable, place on a piece of glass or tin.

In thinning prepared paint, always follow directions printed on label.

If you stand brushes in water overnight, do not sink them below the bristles, or the wool will swell and burst the casings. The best way is to hang them in raw linseed oil, so the bristles are just covered, in a covered vessel.

To remove fresh paint from anything, including brushes, use petrol. Its action is far more rapid and perfect than turpentine, and it is much more pleasant to use.

To put a new brush in proper condition for painting, dip it in paint and lay it aside for several hours, turning it over once during this time.

An oil stain like mahogany can be put on a hard and glossed surface without any roughing of the surface.

To paint wicker work, thin the paint so that it is runny, and use a long bristle brush that is limber in the bristles.

To refinish a hard surface that has become scratched and bruised, it is not necessary to burn away and scrape away all the old surface. All that is required is that it be roughed slightly yet evenly with medium grained sandpaper. Such a roughed surface will grip the first coat of flat paint.

Before using paint that has been standing, strain carefully through a wire screen with a fine mesh so as to remove all foreign particles.

A hard or enamelled surface can be given to anything painted if to each coat of the flat paint there be added clear varnish in the proportion of two of paint to one of varnish, or half and half. This varnish will set the surface hard, and will not chip off so easily as cheap enamel. The varnish can be added to paint of any colour without affecting that colour.

To Bend Metal Pipes.

Get some dry, clean sand. Prepare a tapered wooden plug and drive tightly into one end of the pipe, after making sure that no foreign substance is in it. Stand on end and pour in sand, tapping gently to get it down until it is filled to within an inch of the top. Make a dozen or fifteen thin soft-wood wedges, 6 inches long, and drive them 4 inches into the piping until the end is completely blocked, so that the sand cannot escape. The piping is now, to all intents, solid, and may be heated and bent to the desired angle like ordinary bar-iron. Do not use damp or wet sand, or when it is heated it will either burst the piping or blow out the plugs.

When Moving Bees.

When moving bees a short distance, say, less than a mile, from their usual situation, it is advisable to take them two or three miles away and keep them there several weeks to let the colonies settle down in the strange locality, and forget about the old one, before transporting them to the selected site. When bees are moved only a short distance there is considerable risk of a large number of field bees returning to the old location, where they get lost and perish. When it is necessary to move a hive or two a few yards distant to a better position in the apiary, they should be moved a foot or two each day until the desired place is reached. Any greater distance may cause a deal of confusion and probable loss of field bees.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

ECONOMICAL HOUSEKEEPING.

Last month we talked about the need for spending at least one-third of the family income on food, because without food of the right kind children will not grow and remain well. Don't buy the children's food blindly. Know the right foods they should have and buy accordingly. Even in these days of high prices, economy in housekeeping can be practised by the woman who is a good manager and has some knowledge of the values of foods. Everything depends on the housewife and the care and skill with which she spends the available pounds, shillings, and pence which form the family income. It will help her if she makes use of the following hints.

Do not live from hand to mouth. Think out carefully the week's rations for the family—what will be needed and what it will cost.

Buy the food supplies yourself at local cash shopping centres. Watch the market prices, or listen to them on the radio, and buy what is cheap and in season.

Buy wisely. It is not the costly foods that are the most valuable. The cheaper cuts of meat if nicely cooked have just as much body-building value as the most expensive. Liver and kidneys are particularly valuable foods, and are usually cheaper than other meats.

The best vegetables are those you grow yourself, and if you have even a small piece of ground you can grow silver beet, lettuce, carrots, tomatoes, and parsley. With a larger plot you can add other varieties and easily grow enough vegetables to support a family. Even if you have no ground at all, you may grow lettuce, parsley, and tomatoes in tins or boxes, and save two or three shillings a week. If you have a yard, plant a lemon tree or an orange or a few papaws. Choko vines can be grown over fences or outhouses and pumpkins and squashes in spare corners.

Do not waste your money on ready-cooked or tinned foods, biscuits, rusks, or fancy breakfast foods. First or second break wheatmeal is the best breakfast food, oatmeal comes next, and both are inexpensive. Left-over porridge may be made into milk puddings, so may stale bread or scones, or these may be made into rusks or fried into sippets of toast. Stale cake may be made into trifle with junket or custard and jam. Crumbs are always useful for cooking. Cold potatoes may be sliced for salads, made into soup or into scones.

The one thing of which you should always buy enough is milk. Every child under six should have at least one pint of milk daily; from six to sixteen, half a pint at least is absolutely necessary owing to the big demand for the growth of

bones and the development of the teeth. Expectant and nursing mothers *must* have at least a pint of milk a day, and the rest of the family require half a pint. Milk supplies more valuable nutrient material for its price than any other food and cannot adequately be replaced in the diet. In the west and north-west where fresh cow's milk is not available, goat's milk or dried milk should be used. *Do not skimp on milk.*

Save fuel by arranging your meals so that several dishes may be cooked at the same time. Remember that raw fruits are better than cooked fruits, and well-washed lettuce with sliced tomatoes and shredded young carrots should sometimes replace cooked vegetables.

If there is any difficulty with the family budget or advice is wanted on any other diet problem, write to the *Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane,* or address letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

IN THE FARM KITCHEN.

Culinary Uses of Lemons

Not only do lemons enter into the preparations of all sorts of dishes—they have many other culinary uses, including:—

In boiling fish, add lemon juice to the water; this helps to keep it whole and thus preserves flavour and nutriment.

A few drops of lemon juice in the water in which old potatoes are cooked will keep them from discolouring.

Before using bananas or apples for salads or desserts, sprinkle them with lemon juice to preserve their colour.

A few drops of lemon juice in the water in which eggs are poached will keep the eggs from separating.

When whipping cream, add three or four drops of lemon juice to a cup of cream to make it stiff and firm.

A teaspoon of lemon juice added to the water in which lamb and veal for stew are cooked will improve the flavour and tenderness of the meat.

One dessertspoonful of lemon juice added to one pint of brine used for preserving vegetables improves their flavour and colour.

Dutch Apple Tart.

Children love this tart, for which you require some cooking apples (windfalls will do), some sultanas, sugar, a little lemon flavouring, and short pastry. Grease a shallow tin and cover it with a rather thick layer of pastry, then slice the apples, mix with the chopped-up sultanas, sprinkle a little sugar over, then add a few drops of lemon flavouring, dot with margarine and cover with a top layer of pastry. Brush over with milk, sprinkle with sugar, and bake in a moderately hot oven till done.

Green Tomato Pickle.

No sugar necessary. Take 6lb. green tomatoes, 2 lb. onions, 1 lb. beans (or cucumber), 1 oz. allspice, 4 cups golden syrup, 1 oz. turmeric, ¼ lb. salt, ½ cup flour, ¼ lb. mustard, 2 quarts vinegar, 1 oz. cloves, 1 teaspoon cayenne. Cut vegetables overnight and sprinkle with salt. In the morning drain and boil half-hour with the syrup, vinegar and spices. Mix mustard flour and turmeric with a little extra vinegar and boil all another five minutes.

"Scotch Baps."

To make these, take 1 lb. flour, add to this ¼ oz. bicarbonate of soda, add ½ oz. cream tartar. Well mix, then add a pinch of salt and work in 3 oz. butter. Now add sufficient milk to make into dough (sour milk if possible). Roll out, cut into triangles, dust with flour, and bake for 15 minutes. These are usually eaten cold.

Apple Tartlets.

Line a dozen patty tins with good short pastry, and bake about 20 minutes in a moderate oven. When cold fill with the following: One gill of apple pulp, sugar to taste, a pinch of ground cloves, ½ oz. butter, 1 egg, all put in a pan and stirred over a gentle heat till cooked. Do not boil. Fill up the prepared pastry cases. Bake again for four or five minutes till slightly brown. Serve hot or cold.

QUEENSLAND WEATHER IN APRIL.

Above-normal rainfall distribution during the month was confined to the South Coast, Moreton, and Darling Downs, the former 27 per cent. and the latter 8 per cent. above normal, being mainly due to rains on 1st, 16th, and 22nd. South Coast Moreton registered several three to four inch falls on 1st, highest being Springbrook 861, Dunwich 830, Maryborough 560, Tamborine 572, Southport 535, Tallebudgera and Palmwoods 500. These flood rains following flood rains of the previous month were probably not welcome and not needed in these districts already soaked with March rains. Excepting for South Coast Port Curtis, 22 per cent. below normal, and Peninsula North, 36 per cent. below normal, all other districts were 70 per cent. to 100 per cent. below normal. The majority of these benefited from the almost general March rains, but the Central Lowlands and Lower Western Divisions, receiving patchy amounts in February and being below normal in March, still need rain in some parts to ensure winter pastures. Heaviest rainfalls for the month were Sprinkbrook 1,103, Dunwich 1,050, Coolangatta 880, Bribie Island 805, and Tallebudgera 802.

Floods.—The Burdekin, Fitzroy, and Burnett River systems carried considerable run-off water for the first week of April, but continued to fall steadily, the Inkerman Bridge, over the Burdekin, being clear for traffic on and after April 1st. Flood rains over South Coast Moreton on 1st caused sharp stream rises in the Mary and Logan Rivers, but, without heavy rains following, these streams had fallen below danger level by 3rd. The Condamine, Balonne, and Macintyre continued to carry considerable run-off water until 8th, rainfall on the head-waters of these streams on 1st April and late March taking some time to pass down these streams.

Pressure.—Pressure changes in the first week of April showed a marked change over from Summer to Winter type charts. The active cold front moving across the Continent on 31st March, followed by a vigorous high pressure system, reached the coast on 1st April, its passage being associated with widespread rains in the south-eastern quarter of the State and flood rains South Coast Moreton. By 3rd the high pressure system had covered the whole Continent, had replaced entirely the warm moist northerly air which gave such widespread rains during March and had produced strong S.E. winds on the Queensland coast. These were further strengthened by a depression which developed over New Caledonian waters on 4th, and, resulting from these two systems, strong S.E. winds and very rough seas were unfortunately experienced on the Queensland south coast during the whole Easter period and persisted until 9th. From 9th to 14th normal seasonal highs moved across the Continent, but on 15th a dip developed on a weakening cold front in the south-eastern quarter of the State where light to moderate rain fell during 15th, 16th, and 17th, with local heavy South Coast Moreton.

South-easterlies persisted along the coast for the first two weeks, with rough seas south from Townsville from 3rd to 8th and slight to moderate seas from 8th to 11th. Otherwise seas were chiefly smooth to slight but slight with patches moderate along the south coast on 19th and from 27th to end of the month.

Temperatures.—A cool night with mean maximum temperatures chiefly below normal, except at Palmerville, 2 deg. above normal, where highest maximum for the State was 96 deg. on 17th. Thargomindah, with mean maximum 4.5 deg. below normal, had chiefly below normal daily maxima after 11th and Rockhampton, with mean maximum 4 deg. below normal, had below normal daily maxima after 17th. Excepting Palmerville, highest temperatures for the State were recorded in central, western, and Carpentaria where highest maxima ranged from 91 deg. to 95 deg. Minimum temperatures were generally below normal for the latter half of the month; falling minima after 7th showing signs of the approaching winter. Mean minimum temperatures were chiefly below normal, ranging from 5.5 deg. below at Mitchell and 5.2 below at Georgetown to 0.4 deg above normal at Brisbane. Many minimum temperatures were below 50 on the Downs, Maranoa, Warrego, and Central Highlands on the 16th, 17th, and 18th, Tambo 39 deg. in screen and 33 deg. on grass on the 18th being the lowest. Again for these districts, from 22nd to the end of the month many minima were below 50 deg., a cold snap on 28th resulting in frosty conditions at Mitchell where grass minimum was 29 deg. and at Tambo grass minimum 31 deg.

Brisbane.—Mean Pressure $\frac{9 + 3}{2}$ 29.978 ins. (normal 30.039 ins.). Temperatures.—Mean maximum 78.2 deg. (normal 78.8 deg.), highest 84.5 deg. on 12th; mean minimum 61.8 deg. (normal 61.4 deg.), lowest 55.9 deg. on 20th; mean temperature 70 deg. (normal 70.1 deg.).

Rainfall.—654 points on 12 days (normal 366 points on 12 days). Highest April rain since 894 points in 1933. Rainfall position summarised:—

Division.	Normal Mean.	Mean April, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	659	423	36 below
Peninsula South	164	Nil	100 „
Lower Carpentaria	101	Nil	100 „
Upper Carpentaria	115	Nil	100 „
North Coast Barron	788	199	75 „
North Coast Herbert	822	126	85 „
Central Coast East	288	41	86 „
Central Coast West	145	Nil	100 „
Central Highlands	150	35	77 „
Central Lowlands	121	Nil	100 „
Upper Western	57	Nil	100 „
Lower Western	80	Nil	100 „
South Coast, Port Curtis	249	194	22 „
South Coast, Moreton	416	527	27 above
Darling Downs, East	161	174	8 „
Darling Downs, West	119	48	60 below
Maranoa	129	12	91 „
Warrego	110	2	98 „
Far South-West	86	Nil	100 „

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

JUNE.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.00	Cairns	8	50	Longreach	26	43
6	6.32	5.00	Charleville ..	24	30	Quilpie	37	33
11	6.34	4.59	Cloncurry	36	63	Rockhampton ..	1	19
16	6.36	5.00	Cunnamulla ..	32	27	Roma	15	19
21	6.38	5.01	Dirranbandi ..	22	16	Townsville ..	8	42
26	6.39	5.02	Emerald	11	28	Winton	29	52
30	6.39	5.03	Hughenden ..	21	49	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	3.21	3.50
2	3.55	4.46
3	4.33	5.43
4	5.15	6.39
5	6.01	7.34
6	6.50	8.27
7	7.43	9.17
8	8.38	10.01
9	9.33	10.42
10	10.28	11.18
11	11.23	11.52
		p.m.
12	..	12.24
	a.m.	
13	12.19	12.55
14	1.16	1.27
15	2.15	2.01
16	3.18	2.39
17	4.25	3.23
18	5.35	4.15
19	6.45	5.15
20	7.53	6.22
21	8.55	7.32
22	9.48	8.42
23	10.33	9.49
24	11.12	10.52
25	11.47	11.52
	p.m.	a.m.
26	12.20	..
27	12.51	12.49
28	1.23	1.46
29	1.57	2.41
30	2.33	3.38

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	24	15	40	30	15	6	46	35
6	30	10	45	24	20	0	53	27
11	23	14	39	30	14	5	45	34
16	14	25	30	41	5	16	34	48
21	10	29	26	44	0	19	28	52
26	19	18	35	34	10	9	40	38
30	27	13	43	28	18	2	51	31

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	41	19	57	43	42	28	34	17
3	50	10	64	37	48	23	41	10
5	54	5	67	34	51	20	44	6
7	53	4	67	33	50	19	44	5
9	47	9	63	36	47	22	39	9
11	39	17	56	42	41	27	33	16
13	34	27	53	48	38	33	28	23
15	23	38	46	56	30	41	20	33
17	13	47	39	62	24	47	12	39
19	6	53	35	66	19	51	5	44
21	6	51	35	64	20	50	6	43
23	14	41	39	58	24	44	13	35
25	25	31	47	51	32	36	21	26
27	34	26	54	47	38	33	29	22
30	48	11	63	38	48	23	40	11

Phases of the Moon.—Full Moon, June 4th, 5.27 a.m.; Last Quarter, June 12th, 8.58 a.m.; New Moon, June 19th, 7.26 a.m.; First Quarter, June 25th 10.25 p.m.

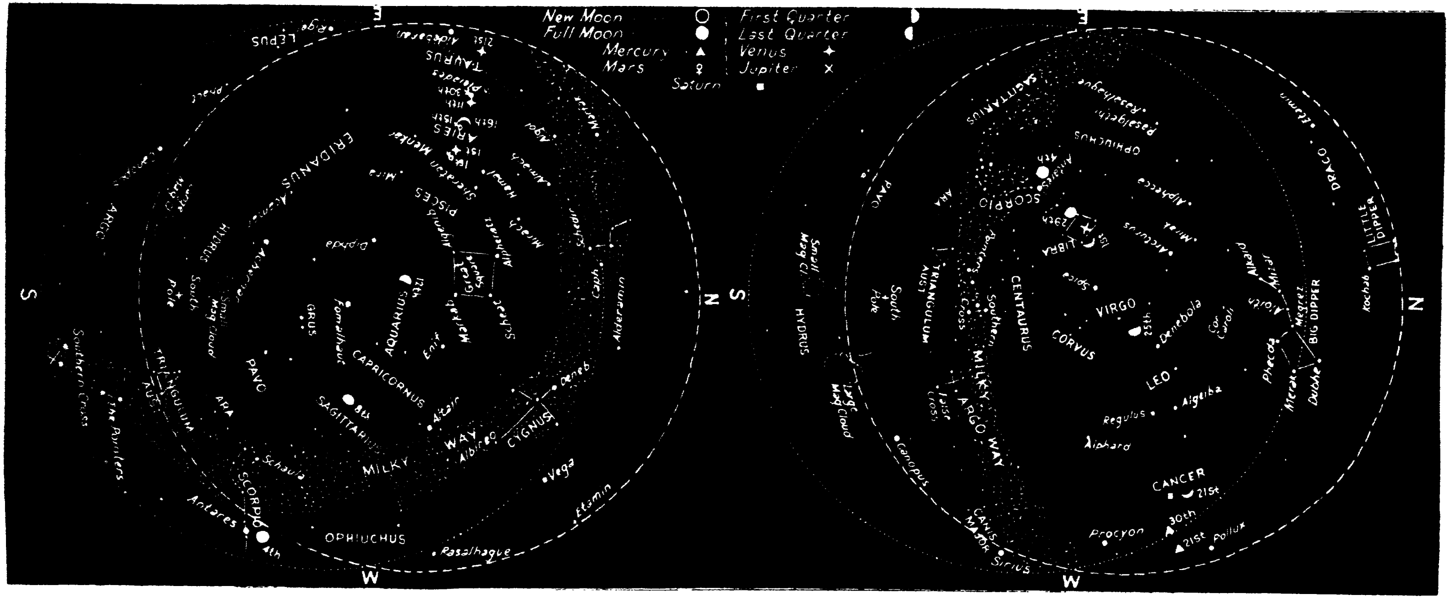
Solstice.—On June 22, at 4 p.m., the Sun will reach its maximum angle north of the equator and will then rise and set about 25 degrees north of true east and true west respectively.

Partial Eclipse of the Moon.—A partial eclipse of the Moon will be visible from Queensland on the night of June 3rd-4th. The Moon will enter the penumbra of the Earth's shadow at 2.49 a.m. on June 4th, after which there will be a noticeable decrease in its brilliance.

At 4.56 a.m. the Moon will enter the umbra and a dark "bight" will appear on the edge of the Moon. This "bight" will increase until 5.15 a.m. when it reaches its maximum. By 5.34 a.m. the full disc of the Moon will again be visible and the emergence from the penumbra occurs at 7.42 a.m.

Mercury.—An evening object all this month. In the constellation of Taurus, will set about 1 hour after the Sun on the 1st, and on the 17th will reach its greatest angle east of the Sun, when it will set about 1¾ hours after sunset. Towards the end of the month it will be in the vicinity of Castor and Pollux in Gemini. On the 30th it will set about 1½ hours after the Sun.

Venus.—Still a morning object. At the beginning of June, in the constellation of Aries, will rise about 2 hours before the Sun, but at the end of the month, in the constellation of Taurus, will rise only 1 hour 18 minutes before the Sun.



Mars.—On the 1st, in the constellation of Aries, will rise 2½ hours before the Sun and on the 31st, in the constellation of Taurus, will rise between 3.45 a.m. and 4.45 a.m.

Jupiter.—In the constellation of Libra may be seen throughout the night this month. At the beginning of June will set just before sunrise about 18 degrees south of true west. At the end of the month it will set between 2.45 a.m. and 4 a.m.

Saturn.—Will now set during the evening—between 9 p.m. and 10 p.m. on the 1st and between 7.15 p.m. and 8.30 p.m. on the 30th.

Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th June. (For every degree of Longitude we go west, time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the N.S.W. border. When facing North hold "N" at the bottom; when facing South hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about one hour earlier han that time. The positions of the moon and planets which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

APRIL RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April	No. of years' records.	April 1946.	April 1947.
North Coast.	In.		In.	In.
Atherton	4·42	42	2·20	1·99
Cairns	11·23	61	0·84	4·21
Cardwell	8·78	71	0·52	1·45
Cooktown	8·69	67	1·77	0·93
Herberton	3·73	57	0·49	0·83
Ingham	7·64	51	0·27	0·68
Innisfail	20·21	62	2·84	4·16
Mossman	7·41	19	0·88	3·41
Townsville	3·29	72	0·03	0·01
Central Coast.				
Ayr	2·77	56	0·10	..
Bowen	2·91	72	0·12	0·29
Charters Towers	1·54	61	..	..
Mackay	6·31	72	0·53	0·99
Proserpine	6·11	40	0·33	1·21
St. Lawrence	2·73	72	..	0·79
South Coast.				
Biggenden	2·15	44	0·58	5·16
Bundaberg	3·25	60	2·73	1·99
Brisbane Bureau	3·66	95	4·11	6·54
Caboolture	4·48	67	4·48	2·94
Childers	2·85	48	1·56	3·74
Crohamhurst	6·68	50	8·77	..
Esk	2·89	56	1·51	2·06
South Coast—cont'd.	In.		In.	In.
Gatton College	1·86	44	1·13	..
Gayndah	1·46	72	0·14	5·42
Gympie	8·43	78	4·21	4·66
Kilkivan	2·20	62	2·09	4·44
Maryborough	3·81	72	2·50	6·78
Nambour	6·13	47	6·92	6 21
Nanango	1·93	61	1·42	3·45
Rockhampton	2·53	72	0·14	0·44
Woodford	4·52	55	5·29	2·32
Darling Downs.				
Dalby	1·39	73	0·97	1·06
Emu Vale	1·32	47	1·00	2·18
Jimbour	1·42	64	0·60	1·48
Miles	1·43	58	1·78	0·35
Stanthorpe	1·70	70	0·79	3·35
Toowoomba	2·56	71	1·63	2·11
Warwick	1·60	78	1·22	1·54
Maranoa.				
Roma	1·28	69	0·25	..
St. George	1·29	62	0·47	0·42
Central Highlands.				
Clermont	1·64	72	..	..
Springsure	1·56	74	..	0·29

CLIMATOLOGICAL DATA FOR APRIL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	86	69	91	1	58	27	421	9
Herberton	..	77	57	84	17	45	28	83	7
Townsville	..	86	67	92	1	59	27	1	1
Rockhampton	..	..	..	..	..	..	..	..	..
Brisbane	30·01	78	62	84	12	56	20	654	12
Darling Downs.									
Dalby	..	77	52	81	1	43	30	106	4
Stanthorpe	..	69	50	74	12	41	24, 28	335	11
Toowoomba	..	72	51	79	12	42	28	211	9
Mid-Interior.									
Georgetown	29·92	89	61	93	16	50	22, 27, 28	..	..
Longreach	30·01	87	59	92	19, 20	43	26	..	..
Mitchell	30·04	79	47	87	21	35	28	..	..
Western.									
Burketown	..	90	64	94	21	57	24, 27	..	..
Boulia	29·98	85	58	94	11	45	29	..	..
Thargomindah	30·03	78	55	88	11	39	28	..	..

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Volume 64 Part 6

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Edited by
J. F. F. REID
Associate Editor
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Contents

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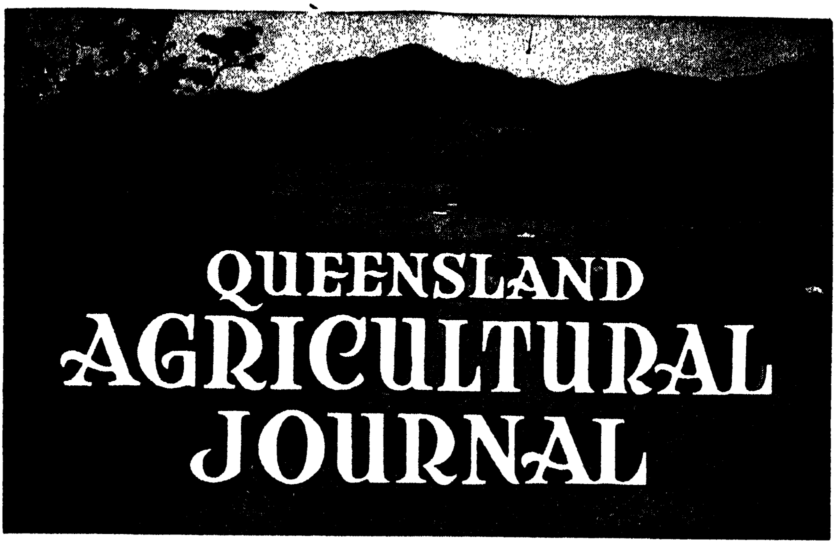

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Event and Comment.

Farm Economy in Other Countries.

CONJOINTLY with the Commonwealth Government, Australian dairying organizations arranged for an overseas visit last year by Messrs. G. C. Howey (Member of the Australian Dairy Produce Board and a director of the Commonwealth Dairy Produce Stabilization Committee) and Chris. Sheehy (Commonwealth Controller of Dairy Products and General Manager of the Dairy Produce Equalization Committee). The primary purpose of their mission was to assist in the negotiations between the Commonwealth and the British Ministry of Food in respect of butter and cheese values under the existing long-term export contract. Other objects included a study of trends in relation to milk production and usage and farm economics generally in the British Isles, United States of America, Canada, Denmark and other European countries. An account of this important mission has now been published in the form of a comprehensive report of particular interest to all engaged in the dairy industry.

In a chapter of the report dealing with farm economics, it is remarked that in all the countries visited farming is usually conducted as a "mixed" undertaking. Consequently, while the "profitability" of a property as a whole may be determined, it is most difficult if not impossible to fix the actual cost of producing one single commodity, such as milk; in some countries only one-third of the total farm income is derived from darying. It was found that except on some large estates on which outside labour is employed the basis of milk production is the

family unit. Generally, more labour is required than is customary in Australia because of the necessity of housing cattle during the cold months of the year and of growing and storing winter feed. In most of the countries visited hired labour is scarce and wage scales are on higher bases than in Australia; but as cows have to be tended on seven days a week, the final burden rests on the farmer and his family. Stock and land values are generally much higher than in Australia and, coupled with additional labour costs of herd management, are reflected in higher production costs. Average herd numbers are low, ranging from six to sixteen cows. Published figures of average production of milking cows were deemed to be misleading, but from inquiries made the individual cow average in most of the dairy countries varied from 500 to 750 gallons a year even in the existing conditions of protein-rich fodder shortage.

In the main dairying districts of North America, farm lands are sown approximately in the proportion of one-third pastures, one-third hay, mostly lucerne, and the remaining third cereals—maize, wheat, oats or barley—while in some sections soy beans are extensively grown. Harvested crops are threshed and the grain stored for winter feeding of farm stock, thus ensuring a balanced agriculture on each holding.

In the chief European dairying countries milk production is associated with crop growing in general diversified farming practice.

In practically all countries in which observations were made cattle are housed during winter, which may last from four to seven months according to the severity of the climate. This obviously results in high production costs, because of the necessity of providing large buildings for fodder storage and the housing of stock and the extra labour involved. The fodder conserved and straw for bedding must be produced during the summer season.

Dairy farm mechanization is extending, particularly in North America and Great Britain; a wide range of equipment is now available although the supply position has been difficult. While most small dairy herds are still usually milked by hand, the use of milking machines is steadily increasing, contributing factors being the shortage of labour and doubling of wages for farm help. Stress is therefore placed on the *output per man* rather than the output per cow or per acre. In the usual type of tie-up stall the bucket plant is the most popular, while with some of the larger herds where a special milking shed, or "milking parlour," is provided the overhead milker is used; to this may be added the recorder plant, which consists of a glass container attached to each unit by which the weight of milk from each cow is automatically recorded. Steam sterilization of dairy equipment is favoured by the British farmer, while the hypoclorite method is more popular in North America. In Britain and the Continent the surface cooler, either corrugated or tubular, is preferred, while in North America the favoured method is immersion of the can in cold water because of less risk of contamination. Electric power is an increasing factor in dairy farm economy.

The report under review contains much other interesting and useful information and may be accepted as a valuable contribution to our knowledge of the science, practice and economy of dairy production. It is well worth close study by all engaged in the dairy industry.

Two Novel Agricultural Implements.*

G. BATES.

Introduction.

IN the struggle to keep down rising costs of production, growers are constantly on the lookout for any method which will enable them to do a particular job more easily, and this has been doubly so during the war years when farmers, like everyone else, were faced with an acute manpower shortage.

Many cane farmers have given up horse work altogether and are using high clearance tractors, which certainly have done a good job. However, there are many who still do most of their cultivation with horses and it is these who will be interested in the methods adopted by T. J. Trembath, of Babinda. With a gross area of 158 acres, this grower was faced with the problem of cultivating and keeping cane clean, with little or no man-power.

After some experimental work, Trembath had two implements patented—a "scratcher" for weeding young plant and ratoon cane, and a "scarifier" for inter-row cultivation. Used in conjunction with each other, and under conditions prevailing on his property, they have been highly successful and have kept down hoe work to a minimum. During the past two years two permanent men, together with casual labour costing £300 per annum, have performed all the farm work with the exception of cane cutting. This contrasts vividly with other years when up to 15 men have been employed chipping.

The Scarifier.

The scarifier consists of a rectangular base of wood having a number of tine bars pivotted to the bottom thereof and projecting behind the rear edge. These tine bars have straight shanks and curved ends, with feet attached. Clamping bars are provided on the base plate to hold the tine bars in position. The seven tine bars are of various lengths and are made from $1\frac{3}{4}$in. spring steel and are set in V formation. The spread of the tine bars is adjustable, according to the width of the cane row. The shafts are mounted obliquely on the top of the base plate and there are securing chains on the ends of the shafts to secure to the collar hames of the horse (Figs. 80 and 81).

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* Paper presented at the Bundaberg Conference, Q.S.S.C.T., April, 1946, and reprinted from *The Cane Growers' Quarterly* (Bur. Sug. Expt. Stns., Dept. Agric. & Stock, Q.), Jan., 1947.

The old type of scarifier has always seemed to the writer to be a clumsy implement which even had to be held up by the operator. The one under discussion is so constructed that it follows closely on the horses' heels and balances itself, requiring no handling by the operator. It is this feature which makes the implement so valuable, for one man can handle up to five independent units, and so scarify up to five rows simultaneously. This is a distinct advantage in a climate of uncertain weather and high rainfall, where weeds grow quickly and it is necessary to make the most of fine weather. On a recent demonstration the writer witnessed a team of five units scarify a 4·7 acre block in 55 minutes, the length of the rows being 15–16 chains. Fig. 82 illustrates a group of six units. The horses are turned into the rows independently and are not even coupled together. It is customary to place the fastest horse in the middle where it can be more easily controlled with the reins. The horses are quick to learn and soon it is only necessary to start them off, the reins being trailed loosely behind.

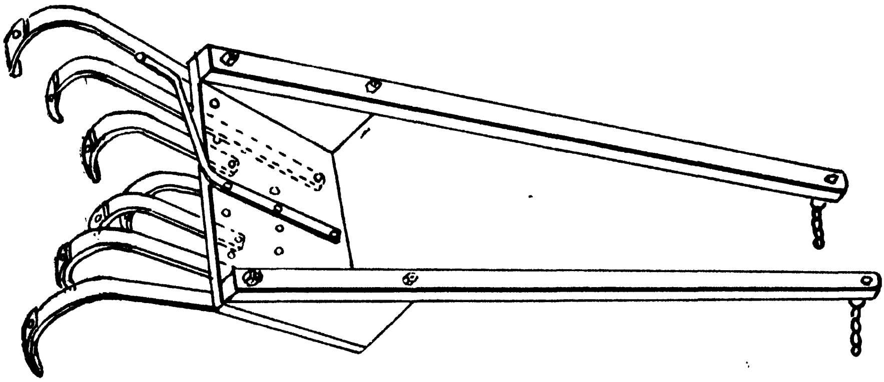


Plate 101.
A DIAGRAM OF THE SCARIFIER.

The weight of this scarifier is in the vicinity of 100 lb. and farmers who use them say that the draught is slightly heavier than with the conventional type of scarifier. Horses, however, get a short spell at the end of each row while turning round and it is not usual to have a change of horses waiting on the headland. The depth of cultivation may be increased by using ballast which can be placed on the base plate. This, however, is seldom needed. The height of the base board is 14 inches, giving ample clearance so that the implement will not clog up with half burnt tops in the event of a bad burn. This clearance is also an advantage in rough country, having large stones. For scarifying plant cane, where the centre of the drill is in the shape of a mound, the two outside tines are made longer than the others so as to cultivate close to the plant.

The Scratcher.

The scratcher consists of an angle iron frame 6 ft. 6 in. x 8 in. to which is attached a pair of shafts. At each end of this framework a set of spring tines is attached, similar to those used behind a Cotton King and other types of standard cane cleaners (Fig. 83). For weeding young plant cane six to eight tines are used, depending on the width of the open drill, but for ratoons some tines are taken out according to the density of the stooling. With this implement it is customary to use three units, each scratching two rows of stools. The weight of the implement is about 80–90 lb. and ballast is used if necessary.

Plate 102.
DEPICTING THE SCRATCHER AT WORK.

With the intelligent use of these two implements, one to clean the soil between the stools and the other for inter-row cultivation, cane can be kept clean, and hoe work reduced to a minimum. It is admitted that certain soils—such as the red volcanic soils and those of a sandy nature—lend themselves admirably to this type of implement, but they are valuable also on the heavy buff alluvials according to farmers who use them. The whole secret of success is to put these implements over the land, *before* the weeds appear, and where such a large area can be covered in so little time there is no excuse for not doing so.

Recently there have been other ideas brought forward in connection with the scratcher; one modified implement has been mounted on wheels with a lever to control depth. However, with the implement described above, one of the main features is the low capital cost, being in the vicinity of £7. This means that a farmer of moderate means may own a set without any high capital outlay. While the more elaborate implements perform work of a similar character, they are, of course, necessarily higher in price.

Plate 103.
A VIEW OF THE SCARIFIER READY FOR OPERATION.

Plate 104.
ILLUSTRATING A GROUP OF SIX SCARIFIERS IN THE FIELD.

ANT PROTECTIO

Squirter Disease in Bananas.

J. H. SIMMONDS, Officer in Charge, Science Branch.

EACH year reports come to hand of depression in banana prices due to the appearance of squirter in the southern markets. Growers are prone to underestimate the seriousness of this disease as they rarely see an infected fruit, unless it is an occasional one in bananas left to ripen in the packing shed.

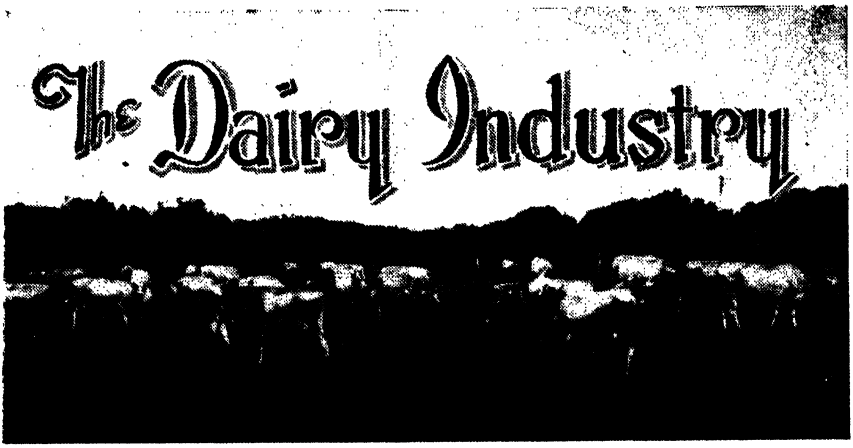
Squirter is caused by a fungus which infects the fruit through the broken stalk end, but starts to actively rot the fruit only after the latter has reached the "sprung" stage. A dark watery rot is set up along the centre of the fruit, which, when the rot is well advanced, may be squeezed out in a stream from the stalk end—hence the name. It is almost impossible to detect this rot from the external appearance of the fruit, so once fruit of a certain brand is known to be affected this brand is difficult to dispose of so long as squirter is about.

Fortunately, experiments have shown that, by the use of the fungicide Shirlan W.S., infection of the fruit can be prevented by destroying the fungus before it enters. The procedure is a relatively simple one compared with the control of many other fruit diseases.

The bunch is first separated into "singles" or part hands and the fruit are then immersed for half a minute or more before packing in a solution of Shirlan made up at the rate of ½ lb. Shirlan W.S. to 30 gallons of water, to which a wetting agent such as Agral or Wetsit has been added. Alternatively, the fruit may be packed and the case then immersed in the solution held in a suitable vat or drum. With the latter method care must be taken that the liquid thoroughly penetrates the case and no air pockets remain. A drainage tray should be provided to conserve the dipping solution.

Squirter is normally seasonal in its occurrence and appears only during the cooler months; that is, from about May to October. During this period, for their own sake and for the good of the industry as a whole, banana growers would be well advised to treat their fruit as described above. This treatment in addition will reduce the amount of black end—some of which is caused by the same squirter fungus—so that a more attractive fruit is marketed.

Shirlan W.S. may be obtained locally at about 12s. 8d. a lb. The cost of the wetting agent is a minor consideration.



Sampling for Butterfat Tests.

E. B. RICE, Director of Dairying.

RELIABLE sampling and proper care of samples are of the utmost importance in dairy factory work. Unless every precaution be taken to ensure that the sample is truly representative of the bulk the results of any test or analysis are misleading and worthless and, moreover, may cause serious lack of confidence by the producer in the factory. A full appreciation of the importance of sampling is most necessary for dairy factory staffs.

Sampling Milk.

(*a*) *Individual Cow Samples.*—In taking a sample of the milk of an individual cow, mix the milk by pouring it from one vessel to another several times. Always take enough milk to enable a duplicate test to be made if necessary (about 6 oz.). As the fat tests at the morning's and evening's milking vary, separate samples are necessary unless a composite sample from the two milkings is taken. This may be obtained by using a graduated pipette and taking a number of millilitres (c.c.s.) for each pound of milk at each milking. A suggested rule is: 2 ml per lb. milk for cows giving over 20 lb. daily; 3 ml. per lb. for cows giving between 15 lb. and 20 lb. daily; and 4 ml. per lb. for cows yielding between 10 lb. and 15 lb. daily.

(*b*) *Individual Can Samples.*—These may be taken simply by thoroughly stirring the milk with a rotary motion, by means of a combined metal stirrer and sampler, and dipping the sample straight into a sample bottle. Patent milk sampling tubes, of which there are several kinds, enable a small column from the top to the bottom of the well-stirred milk in the can, and thus a strictly representative sample, to be taken. A plain glass tube may be used by inserting it perpendicularly to the bottom of the can, pressing a finger firmly on top, and then transferring the sample to a sample bottle. In sampling milk when the fat is partially churned, warm to about 110°F., long enough to melt the fat, vigorously shake, and at once carry out the fat test.

(c) *Composite Milk Samples.*—It is the usual practice at cheese factories to keep a composite sample of each supplier's milk. This avoids the necessity for daily fat testing. To prevent the souring of the composite sample a small quantity of preservative (0., ml. of formalin usually) is added to each bottle each week prior to the reception of the samples. The volume of the sample taken daily should strictly be proportionate to the bulk. As, however, there is usually not a sudden variation in the quantity and quality of the milk delivered daily by each producer, one ounce may be taken daily for the sample. To facilitate sampling, the 8 oz. composite sample bottles are marked with a glass line to denote each ounce of capacity. Generally, the sample is taken from the milk after it is tipped into the weighing vat, a small dipper being used for the purpose. Where dip sampling is practised it is necessary to stir the milk in the weigh vat, or the cans, before it is tipped. A "drip" sample is more accurate than a dip sample. This is conveniently secured by placing a bottle beneath a fine hole drilled in the fluming leading from the weighing vat. As the milk flows along the fluming some is collected in the bottle and one ounce is then added to the composite bottle. Care must be taken to add only one ounce. After adding the fresh sample the bottle should be thoroughly shaken (with a rotary motion) to ensure even distribution of the preservative and mixing of the fat with the remainder of the sample and so preventing it from adhering to, and drying on, the side of the bottle.

Composite samples should be kept under lock and key, in a cool, dark place on or convenient to the factory platform. Composite sample bottles must have wide necks and tightly fitting stoppers (preferably rubber or ground glass), be durable, easy to clean and properly marked to identify each sample.

Preserving Composite Samples.

To prevent souring of composite samples, certain chemicals are used.

Formalin is mostly used in Queensland and, provided it is not used in excess, is satisfactory. In excess it hardens the milk casein and causes some difficulty in Babcock testing. It cannot be used if casein is also to be determined on the sample of milk. 0.5 ml. suffices for an ordinary composite test bottle or ½ pint of milk.

Potassium bichromate is not very satisfactory as it also hardens the casein of milk, is difficult to dissolve in milk, and needs a fair amount to prevent souring (half a gram per composite sample bottle or ½ pint of milk).

Mercuric chlorine (*corrosive sublimate*) may be used for preserving samples to be tested for casein as well as fat. It is sold as coloured tablets and is readily soluble in milk. As it is a strong poison, the container should be plainly marked in red letters with the word "POISON" and stored in a safe place. One tablet is used per composite test bottle or half pint of milk.

Sampling Cream.

Cream samples from each day's delivery are tested separately in Queensland butter factories. Composite sampling is not carried out because of the difficulty of sampling sour cream, unequal number of separations in different deliveries, and the uneven consistency throughout the mass of many farm creams.

Before sampling, the cans of cream are well stirred with a tinned brass stirring rod the bottom portion of which consists of a saucer-like metal attachment for drawing the sample. In the event of a supplier's consignment consisting of more than one can of cream, the usual (though not strictly accurate) procedure at butter factories is to dip a small portion of the stirred contents of each can into the sampling mug. Only if the portion of the sample taken from each can is proportional to the weight of cream in all cans in the consignment is such a sample truly representative. Some factories test a sample taken from every can. Greater accuracy is thus secured than by assessing the commercial butter content from a mixed sample from a number of cans. As, however, the commercial butter content is calculated from the total weight of cream in the consignment and the mean of the fat tests of the different cans, the true content of commercial butter is not recorded. This would only be ensured if the commercial butter content of each can of cream were computed separately from the weight of the cream and its fat content.

A Note on Farmers' Samples.

Any farmer who sends a sample of milk or cream to a laboratory, or elsewhere, for testing must be warned against the using of the result as a check against factory tests. A sample of night's milk or morning's milk, or even the mixed milk, may vary in butterfat test from a weekly composite sample, which is taken at a cheese factory. Similarly, a sample of cream, unless truly representative of the number of separations included in a consignment sent to a butter factory, will differ from the factory test.

Dairy Officers of the Department of Agriculture and Stock are always willing to carry out check testing on behalf of any farmer and in this way check testing may be carried out with satisfaction to all parties concerned.

Dairy Produce Act in Relation to Sampling.

Regulation No. 153 provides for a representative sample to be taken in all cases where dairy produce is sampled for analysis or testing.

Regulation No. 149 provides for samples to be taken of milk or cream supplied to factories, and the keeping, for certain periods, of samples after testing for butterfat. Samples taken before noon are to be retained until 3 p.m., samples taken between noon and 3 p.m. are to be held until 5 p.m., and samples taken after 3 p.m. are to be held until 11 a.m. next day. An inspector may, however, order any samples to be kept for a longer period than just indicated.

Regulation No. 165 permits a representative sample, which shall be proportionate to the quantity of milk received to be taken from each individual supply at cheese and condensed milk factories and placed in a composite-sample bottle. The composite samples are to be tested for butterfat not less than four times monthly, at approximately equal periods. The composite-sample bottles are to have a permanent number marked on them, to be kept in a cupboard which shall be locked when not in actual use, and each bottle is to correspond with the number allocated to the supplier on the platform sheet.

Regulations No. 150 and No. 165 empower an inspector to sample and test any milk or cream at a factory and, if deemed necessary, to correct or order the factory results to be altered.

Requirements for Milk-supplying Farms.

C. R. TUMMON, Dairy Adviser.

SOME farmers are of the opinion that, in order to change over from cream to milk supply, much alteration is needed to dairy buildings, equipment, etc. The only major additional item required for milk supply is a suitable milk cooler. Though the *Dairy Produce Act* sets out certain regulations to which all dairies should conform and does not discriminate between milk and cream suppliers, it is necessary for certain minimum requirements to be satisfied before a farmer can produce milk for the liquid milk market. These are:—A milking shed with an impervious floor, adequate water supply at the dairy, approved source of hot water, a wash-up trough, and a draining rack upon which to deposit cleansed utensils.

The following notes are offered as guidance in the erection and equipping of milk-supplying dairy farms:—

Milking Shed.

The type of bails or milking shed is optional, but the walk-through, double-bail shed is most popular and recommended. It is easily adapted to the installation of milking machines and avoids the upsetting of individual cows during milking, which is a definite advantage over some of the other crush types of bails. The milking shed should be a sound and suitable structure, having concrete floors and drain—the latter extending 30 ft. from the bails. If machines are in use, or intended to be used, a 6 ft. air space—walled on both sides and ventilated at the ends—should be provided between bails and separator room to house the engine and pump. This avoids congestion in the separator room, keeps oil off the separator room floor, and prevents the absorption of smoke, fumes, etc. by the milk. The separator room or milk room should be sufficiently large to allow ample room for the separator, washing-up vat, sterilizer, and utensil and can racks.

When suitable buildings are constructed, the farmer should go one step further and have them painted. Bails should be tarred or painted some dark colour up to about 3 ft. from the floor and the remaining top portion painted white. The whole of the separator room should be painted white. This improves the appearance of dairy buildings, preserves the wood, and makes cleaning of walls, etc. easier.

Water Supply.

An abundant supply of water is one of the most important features of a modern dairy. It is required for the washing down of floors, cleaning of utensils, and the cooling of the milk. The small tank, which is the sole source of supply at many dairies, is quite inadequate. A water supply laid on from creeks, dams, wells, etc. is probably the best method of providing an ample supply, but failing this, several large tanks should be installed for rain-water catchment.

Cleansing Facilities.

A 12-gallon set-in copper is prescribed for supplying hot water on dairies not using milking machines, while it is necessary to have a steam sterilizer with piping or steam hoses to connect up to the pipe lines of

the machines on any dairy farm using a milking machine. A suitable washing-up trough and rack for holding utensils, cans, &c., are also required.

Straining.

Cotton-wool filter discs to be used for straining the milk are necessary on every milk-supplying dairy farm. They remove much more fine sediment than ordinary wire-gauze strainers. If a wide-mesh gauze strainer is used (about 1/16th in. mesh) in conjunction with filter wads, the difficulty often experienced in getting milk to run through the strainer will be avoided.

Cooling Milk.

Cooling is necessary for milk intended for the liquid milk trade. This serves the dual purpose of aerating the milk to minimise some feed flavours and reducing the temperature to retard the multiplication of bacteria.

There are all sorts of coolers in use, but success is achieved by the tubular types used in conjunction with a tower cooler—a wooden condenser tower erected over a shallow concrete tank—as described in this Journal for May, 1946. The water is circulated by means of a small centrifugal pump over the tower and then through the tubular cooler, over the outside of which the milk flows.

Holding of Milk.

While the milk is awaiting pickup by the carrier it should be kept in as cool a place as possible. If left on the roadside, a well-ventilated shelter shed should be provided. This keeps the direct rays of the sun off the cans and assists in enabling the milk to arrive at the factory at a lower temperature than if the cans were not protected from the sun.

It may be argued that good milk can be produced without erecting a milking shed of approved design and providing the equipment mentioned. Admittedly the human element is an important factor in clean milk production, but the provision of a good building and equipment makes it a much easier job to produce a good article and to maintain conditions befitting the production of such an important food as milk. The progress of the dairy industry is bound up with the type of buildings and equipment on the individual farms, and dairy buildings soundly constructed, well equipped, and of good appearance, would be a definite step towards the uplifting of the dairy industry in this State.

Dairy Field Day at Conondale.

ARRANGED by the district branch of the Queensland Dairymen's Organisation in association with the Department of Agriculture and Stock, the farm field day at Conondale on 1st May was an unqualified success. Mr. F. Fleiter's well-improved property was the venue and over 60 farmers, including visitors from Maleny and Obi Obi, were in attendance under the chairmanship of Mr. J. J. Ahearn.

Mr. Fleiter has a herd of Australian Illawarras of which 90 pure-bred and grade cows are milked daily. In his milking shed is a 3-unit milking plant, a steam boiler, and other installations and equipment regarded as essential in modern dairy practice. The assembly yard, walk-through doorways, and gateways are concreted and other facilities are evidence of the application of sound dairy principles. A large hay and feed shed with stalls for 48 cows is under construction and a silo will be added later.

The day's proceedings included lectures and demonstrations by field officers of the Department of Agriculture and Stock. Mr. R. Haseler, Adviser in Agriculture, addressed the gathering on fodder conservation and the maintenance of soil fertility. Types of silos, machinery for harvesting and handling ensilage crops, the use of legumes in the balancing of rations and their value as soil builders were all covered in the course of a comprehensive and lucid lecture. The assistance given by the Department of Agriculture and Stock also was stressed.

The value of herd testing and what it connotes in profitable dairy practice was clearly expounded by Mr. S. E. Pegg, Senior Dairy Adviser. He stressed the need for increased production per cow and outlined the main points of the departmental herd improvement plan of which herd testing is the basis. This plan involves a departure from the milk sampling method and the adoption of a system of herd testing units and the application of results to sire surveys. The farmers present were greatly interested and assurances of a desire to co-operate with the Department were given. At a meeting to be held soon, the district branch of the Q.D.O. will consider the formation of local testing units on the lines in operation in the Southern States.

An instructional high light in the day's proceedings was a post mortem on the carcase of a cow by Mr. R. McLellan, Veterinary Officer. He dissected and explained the functions of all the parts in the cow's "interior economy"; and demonstrated methods of treating mastitis by injection of affected quarters of the udder with sulpha drugs, and in the use of penicillin. Contagious abortion, its causes and effects, and the uses of "Strain 19" vaccine in preventive treatment also were discussed. The lecturer was kept very busy answering a wide variety of questions on veterinary matters.

The general discussion after each lecture was evidence of the keen interest of all assembled. On the motion of Mr. Ahearn, seconded by Mr. P. Daley (Maleny) the speakers were thanked for their able addresses. An expression of cordial appreciation of the generous hospitality of Mr. and Mrs. Fleiter, and of their public spiritedness in making their fine property available, was a happy ending to a successful field day.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S., Jersey, and Guernsey Societies' Herd Books, production records for which have been compiled during the month of April, 1947. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.).			
Alfa Vale Star 10th	W. H. Thompson, Nanango	13,099·4	556·769	Penrhos Pansy's Pride
Rhodesview Kitty 16th	W. Gierke and Sons, Helidon	13,964·9	533·373	Fairvale Major
Rhodesview Beauty 22nd	W. Gierke and Sons, Helidon	9,413·15	468·923	Fairvale Major
Bileena Butterfly 3rd	C. K. Roche, Warwick	9,837·75	356·684	Tara Governor
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Cress Lea Pride	A. Lohse, Degilbo	8,745·85	369·237	Blacklands Excellent
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Mel Merle Empress 3rd	C. K. Roche, Warwick	8,229·85	347·26	Rhodesview Primroy
Mt. Camp Thelma 34th (174 days)	Madge Bros., Southbrook	7,773·88	291·906	Rosenthal Red Major
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Pilton View Thelma 4th	C. K. Roche, Warwick	10,701·85	364·026	Sunnyview Myrtle's Renown
Fairvale Doris 7th (184 days)	W. C. Henschell, Yarranlea	8,306·7	363·541	Bingleigh Jean's Monarch
Rhodesview Carnation 24th	W. Gierke and Sons, Helidon	7,850·85	323·751	Fairvale Major
College Raceme 4th	Q.A.H.S. and College, Lawes	6,825·35	298·609	Alfa Vale Pride 3rd
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Yarranvale Gentle	W. D. Davis, Chinchilla	7,703·75	344·62	Trevor Hill Bosca
College Rascal 15th	Q.A.H.S. and College, Lawes	6,414·35	292·881	Alfa Vale Pride 3rd
Bileena Buttercup 12th	W. F. Hemmings, Murray's Bridge	7,470·1	265·529	Tara Governor
Fairvale Minerva 3rd (161 days)	W. Henschell, Yarranlea	6,524·4	257·695	Bingleigh Jean's Monarch
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
College Thorn 6th	Q.A.H.S. and College, Lawes	8,541·75	362·952	Alfa Vale Pride 3rd
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Brookland Cunning Drop	W. S. Conochie, Sherwood	10,881·65	693·83	Englorie Cunning Victor
Mayfair Roseslip 5th	J. W. Carpenter, Helidon	7,718·55	426·161	Trecarne Golden King 2nd
Glenview Rochette	F. Eager, Petrie	8,218·75	400·881	Trinity Governor's Hope
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Brookland Merry Primula	W. S. Conochie, Sherwood	6,581·15	320·5	Bulby Maria's Keepsake

JUNIOR, 3 YEARS (STANDARD 270 LB.)

Naiifale Brown Belle	R. J. Browne, Yangan	7,341·4	383·624	Naiifale Count's Prominence
Mayfair Beauty 7th	J. W. Carpenter, Helidon	5,504·2	337·026	Trecarne Golden King 2nd
Glenrandle Luna	P. Kerlin, Killarney	5,864·9	332·417	Bellgarth Stylish
Grasmere Victorious Dove	F. Z. Eager, Neurum	4,643·25	275·444	Navua Victorious Samaritan

SENIOR, 2 YEARS (STANDARD 250 LB.).

Lermont Posy 3rd	J. J. Ahern, Conondale	7,950·45	409·409	Selsey Samares Hallmark
College Floss 6th	Q.A.H.S. and College, Lawes	5,320·2	282·683	Mornmoot Roi
Tecoma Emerald	A. Semgreen, Coolabunia	4,616·8	274·357	Trinity Golden Royal
Westbrook Tulip 134th (204 days)	Farm Home for Boys, Westbrook	5,340·55	264·078	Mornmoot Clementine's Valour

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Gem Cream Lass	W. Bishop, Kenmore	8,056·15	405·534	Gem Prince Prudence
Westbrook Valient	Q.A.H.S. and College, Lawes	5,619·2	281·661	Mornmoot Clementine's Valour
Brookland Regal Maple Leaf	W. S. Conochie, Sherwood	5,074·4	286·449	Brookland Regalia
Westbrook Sultane 9th (219 days)	Farm Home for Boys, Westbrook	5,219·05	238·377	Westbrook Ambassador 52nd

GUERNSEY.

MATURE COW (STANDARD 350 LB.).

Laureldale Violet	W. A. K. Cooke, Maleny	10,606·25	511·715	Linwood Favour

SENIOR, 4 YEARS (STANDARD 330 LB.).

Laureldale Vida (252 days)	W. A. K. Cooke, Maleny	10,312·5	497·771	Minnamurra Topsy's Sequel 2nd

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Laureldale Lorna	W. A. K. Cooke, Maleny	6,313·95	288·978	Minnamurra Topsy's Sequel 2nd

12

MARKETING

Sale of Seeds—Regulatory Legislation.

F. B. COLEMAN, Standards Officer.

PROTECTION of the purchaser of seeds for sowing and the prescription of certain standards with which the seed must comply is provided for in *The Seed Acts of* 1937 *to* 1941. Seeds not up to the standards prescribed are liable to be seized by inspectors under *The Seeds Acts,* and if the material is not brought up to standard, such as by the removal of weed seeds and other foreign matter, destruction of the goods in question may follow. This would represent a total loss; further, the seller would be liable to prosecution.

To set out simply and clearly the definitions and standards stipulated in the Acts and Regulations the following notes have been prepared:

Vendor.—A vendor under the Acts is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds for sowing. A license to sell seeds is not required.

Efficient Seed-cleaning Machinery.—The Regulations do not apply to seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seeds for sowing.

Examination of Samples.—Provision is made for the examination of samples at the Seed Testing Station, Brisbane, upon payment of the prescribed fee; seeds purchased for sowing, and not resale, are examined free. After examination a certificate of analysis is issued. An explanatory note on the certificate is included on page 342 of this article.

Labelling.—At present it is not necessary to label any seeds except those sold in made-up packets on the outside of which the following particulars should be legible and indelibly marked:—

(*a*) The full name and address of vendor or packer;
(*b*) The kind and variety or strain of such seeds;
(*c*) The date after which the contents should not be used.

Certified seeds are required to be sealed and labelled, but are not dealt with in this article.

Standards of Purity and Germination.—The Regulations under the Acts prescribed the maximum proportions or amounts of inert matter, weed seeds, and other crop seeds that may be present in the different kinds of seeds for sowing and the minimum germination. A copy of the Regulations may be obtained free on application to the Department of Agriculture and Stock, Brisbane.

Prohibited.—The principal totally prohibited seeds commonly found in Queensland include—

Carthamus lanatus	Saffron thistle
Chrysanthemum leucanthemum ..	Ox-eye Daisy
Convolvulus arvensis	Bindweed
Cirsium arvense: Syn. *Cnicus arvensis*, Syn. *Carduus arvensis*	Creeping Californian, or Perennial thistle
Cuscuta spp.	Dodder
Datura spp.	Thornapple, Datura
Ipomoea spp.	Morning Glory, Bell vine
Melilotus indica	King Island Melilot, Hexham-scent
Raphanus Raphanistrum ..	Wild radish or Jointed charlock
Rapistrum rugosum	Turnip weed
Salvia reflexa	Mintweed
Silybum marianum: Syn. *Carduus Marianus*	Variegated thistle
Sonchus arvensis	Perennial sow thistle
Sorghum halepense	Johnson grass

Seeds infested with live insect pests in any stage of development, and diseased seeds.

All recognized cultivated varieties of the abovementioned species used for the purposes of cultivation are exempt from this list.

Restricted Weeds.—The Regulations provide that the presence of certain weed seeds shall be limited by count to a maximum number per lb. or oz.

In the case of barley, beans, cowpeas, maize, oats, peas, rye, tares, wheat, and seeds of similar or larger size, the number of weed seeds allowed in 1 lb. shall not exceed the number set out opposite to the weeds in question.

In the case of other seeds, the number of seeds allowed per oz. shall be not more than as set out opposite the name of such seed.

Those which occur most frequently in Queensland are—

Alternanthera repens (syn. *Alternanthera acryantha*, syn. *A. echinata*)	Khaki weed	20
Argemone mexicana	Mexican poppy	10
Brassica spp.	All weed species	20
Cirsium lanceolatum (syn. *Carduus lanceolatus*, syn. *Cnicus lanceolatus*)	Spear thistle	10
Echium spp.	Bugloss	20
Lithospermum arvense	Corn gromwell or Ironweed	20
Marrubium vulgare	Horehound	10
Polygonum spp.	Wireweed	20
Sisymbrium spp.	Mustard weed, Wild mustard	20

A full list of the weed seeds controlled by count is set out in the Regulations.

The following table sets out the main seeds that are sold in Queensland with their standards of purity and germination:—

Kind of Seed.	Inert Matter plus Weed Seeds.	Weed Seeds.	Other Crop Seeds.			Germination.
	By Weight Max. %	By Weight Max. %	By Weight Maximum %			By Count Min. %
Barley other than Malting	1·25	0·25	0·5	Other Barley, Oats, Rye and Wheat	5·0	80
Barley, Malting	1·25	0·25	0·5	Other Barleys	Nil	80
Beans—						
Broad	1·25	0·25	0·1	. .	. .	70
French	1·25	0·25	0·1	. .	. .	75
Lima	1·25	0·25	0·1	. .	. .	75
Mauritius	1·25	0·25	0·1	. .	. .	70
Navy	1·25	0·25	0·1	. .	. .	75
Rice	1·25	0·25	0·1	. .	. .	75
Soy	1·25	0·25	0·1	. .	. .	60
Beet	3·0	0·25	0·2	. .	. .	55 of Clusters
Cabbage	0·75	0·25	0·1	. .	. .	65
Cabbage, Chinese . .	0·75	0·25	0·1	. .	. .	65
Capsicum	0·75	0·25	0·1	. .	. .	50
Cauliflower	0·75	0·25	0·1	. .	. .	65
Carrot	4·75	0·25	0·5	. .	. .	50
Celery	1·75	0·25	0·5	. .	. .	50
Cotton	2·25	0·25	0·2	. .	. .	70
Cowpeas						
Black	5·25	0·25	0·2	Maize . . Teosinte . .	Nil Nil	70
Giant, Clay or Crowder	5·25	0·25	0·2	Maize . . Teosinte . .	Nil Nil	70
Other Kinds	1·25	0·25	0·2	Maize . . Teosinte . .	Nil Nil	70
Cress, Garden	0·75	0·25	0·1	. .	. .	60
Crotalaria spp. (Cultivated)	2·0	0·25	0·2	. .	. .	70
Cucumber	1·25	0·25	0·2	. .	. .	75
Grasses—						
Blue Panic-Giant Panic	20·0	0·25	0·5	. .	. .	50
Canary Seed	1·25	0·25	0·5	. .	. .	65
Carpet Grass	2·0	0·5	1·0	. .	. .	60
Cocksfoot	25·0	0·25	3·0	Yorkshire fog	1·0	60
Couch	2·0	0·5	1·0	. .	. .	60
Green Panic	3·0	0·25	0·5	. .	. .	3
Guinea Grass	3·0	0·25	0·5	. .	. .	3
Mitchell Grass	20·5	0·5	5·0	. .	. .	35
Molasses Grass	1·75	0·25	0·1	. .	. .	30
Paragrass	3·0	0·25	0·5	. .	. .	3
Paspalum	45·25	0·25	0·5	Rhodes Grass	3·0	60
Phalaris tuberosa . .	2·5	1·0	2·0	. .	. .	60
Prairie Grass	5·5	0·5	0·2	. .	. .	65
Rhodes Grass	9·0	1·0	0·5	Paspalum dilatatum	3·0	30
Rye Grass—						
Italian	4·0	1·0	2·0	. .	. .	65
Perennial	4·0	1·0	2·0	. .	. .	60
Wimmera	4·0	1·0	2·0	. .	. .	65
Urochloa or Liverseed Grass	5·0	0·5	0·2	. .	. .	30
Kohl Rabi	0·75	0·25	0·1	. .	. .	65
Leek	0·75	0·25	0·1	. .	. .	50
Lettuce	2·5	0·25	0·5	. .	. .	70
Lucerne	1·5	0·5	0·5	. .	. .	80
Lupins	1·25	0·25	0·2	. .	. .	60
Maize	1·25	0·25	0·2	. .	. .	80
Mangel	3·0	0·25	0·2	. .	. .	55 of Clusters
Marrow	1·25	0·25	0·1	. .	. .	70

Kind of Seed.	Inert Matter plus Weed Seeds.	Weed Seeds.	Other Crop Seeds.			Germination.
	By Weight Max. %	By Weight Max. %	By Weight Maximum %			By Count Min. %
Melons—						
Citron	1·25	0·25	0·1	..	..	65
Rock	1·25	0·25	0·1	..	..	70
Water	1·25	0·25	0·1	..	..	65
Other Varieties ..	1·25	0·25	0·1	..	..	65
Millets—						
Broom	2·25	0·25	0·5	..	..	70
Foxtail	2·25	0·25	0·5	..	..	75
French	2·25	0·25	0·5	..	..	75
Hungarian	2·25	0·25	0·5	..	..	75
Japanese	2·25	0·25	0·5	..	..	75
Manchurian	2·25	0·25	0·5	..	..	75
Pearl	2·25	0·25	0·5	..	..	75
Setaria Giant	2·25	0·25	0·5	..	..	75
Setaria Dwarf	2·25	0·25	0·5	..	..	75
White Panicum ..	2·25	0·25	0·5	..	..	75
Other Varieties ..	2·25	0·25	0·5	..	..	75
Mustard	0·75	0·25	0·1	..	..	65
Oats	2·5	0·5	0·5	Barley, Rye, Wheat	5·0	80
Onion	0·75	0·25	0·1	..	..	50
Parsley	1·75	0·25	0·5	..	..	40
Parsnip	2·5	0·25	0·5	..	..	40
Passion Fruit	1·75	0·25	0·2	..	..	30
Papaw	1·75	0·25	0·2	..	..	30
Peanuts—shelled	5·25	0·25	0·2	..	..	80
Peas (Garden and Field) ..	1·25	0·25	0·2	..	..	75
Pop Corn	1·25	0·25	0·1	..	..	70
Pumpkin	1·25	0·25	0·1	..	..	70
Radish	0·75	0·25	0·1	..	..	75
Rape	0·75	0·25	0·1	..	..	65
Red Clover or Cowgrass ..	1·5	0·5	2·0	..	..	70
Rhubarb	0·75	0·25	0·1	..	..	50
Rosella	1·25	0·25	0·2	..	..	50
Rye Corn	1·25	0·25	0·5	Barley, Oats and Wheat	5·0	75
Sage	0·75	0·25	0·1	..	..	40
Sorghum—						
Broom Millet	2·25	0·25	0·5	..	..	70
Grain	6·25	0·25	0·5	..	..	70
Saccharine	2·25	0·25	0·5	..	..	70
Subterranean Clover ..	2·25	0·25	0·5	..	..	70
Sudan Grass	6·25	0·25	0·5	Other Sorghum spp.	Nil	65
Squash	1·25	0·25	0·1	..	..	70
Sunflower	4·25	0·25	0·1	..	..	65
Sweet Corn	1·25	0·25	0·1	..	..	65
Swede Turnip	0·75	0·25	0·1	..	..	65
Tares (Vetches)	1·25	0·25	0·2	..	..	60
Tomato	2·25	0·25	0·1	..	..	70
Townsville Lucerne ..	3·0	0·5	0·5	..	..	40
Turnip (Table)	0·75	0·25	0·1	..	..	65
Vetch or Tares	1·25	0·25	0·2	..	..	60
Wheat	1·25	0·25	0·5	Barley, Oats and Rye	5·0	80
White Clover	1·5	0·5	5·0	..	..	70
Crop Seeds not elsewhere included—						
Agricultural	3·0	0·25	0·2	..	..	60
Vegetable	0·75	0·25	0·1	..	..	60

Seed Certificate.—The seed certificate sets out the result of the analysis of a sample of seed submitted for examination. This consists of separating the sample into its various parts, i.e., analytical purity—seeds of the kind to which it purports to belong—other crop seeds, prohibited seeds, weed seeds, and inert matter. These parts are weighed and the weights recorded in terms of percentages of the whole.

The other crop seeds, prohibited seeds, weed seeds, and the type of inert matter are named and recorded.

Inert matter includes—

(*a*) Stones, chaff, sand, grit, soil;

(*b*) All portions of seeds or fruits that are one-half or less than one-half the normal size;

(*c*) Fragments of roots, stems, leaves and flowers, empty glumes, single palae, sterile flowers of grasses;

(*d*) Completely decorticated seeds of legumes;

(*e*) Clusters of mangel, beet, and sugar-beet containing no seeds and clusters which pass through a 2-mm.-slit sieve;

(*f*) Part of insects, dead insects, scales, and any other inert matter;

(*g*) *Claviceps sclerotia* (*Claviceps microcephala* and other species) in grass seed samples;

(*h*) Provided that, with respect to the following grasses, inert matter shall not include empty glumes or sterile flowers:—*Chloris* spp., *Melinis* spp., *Panicum maximum*, *Panicum maximum* var. *trichoglume*, *Brachiaria purpurascens* (syn. *Panicum muticum*).

The germination is ascertained by placing a number of seeds (usually 300) on moistened flannelette in a tray which is then placed in a germinator in which the temperature and moisture are controlled to the optimum for the respective kinds of seeds. After the seeds have germinated they are removed and the germination recorded, also the number of days in which it took for such germination.

Often a sample of good seed will germinate in 2 days, while a like kind will in another sample take up to 10 days. Obviously, the quicker germinating sample is to be preferred.

From the certificate can be ascertained the true value of a sample, i.e., the actual amount of seed which will grow (pure germinating seed) and its value can be compared with other lots of the same kind of seed.

For instance, two lots of lucerne seed are offered at, say, 1s. 6d. and 1s. 4d. per lb.—which is £7 10s. and £6 13s. 4d., respectively, per 100 lb. lot with the following analyses:—

	Sample. 1s. 6d. per lb. %	Sample. 1s. 4d. per lb. %
Analytical purity	98.9	98.6
Inert matter	0.7	1.0
Weed seeds	0.2	0.2
Other crop seeds	0.2	0.2
	100.0	100.0
Germination	96%	75%

It will be noted that there is very little difference in the purities but a large difference in the germination, which is quite common.

The amount of seed that will grow in any sample can be obtained in the following manner:—

$$\frac{\text{Analytical purity \% } \times \text{ Germination \%}}{100} = \text{\% Pure germinating seed.}$$

Applied to the "1s. 6d. per lb." sample this gives—

$$\frac{98{\cdot}9 \times 96}{100} = 95\% \text{ or 95 lb. out of every 100 lb. of seed.}$$

and in the "1s. 4d. per lb." sample—

$$\frac{98{\cdot}6 \times 75}{100} = 74\% \text{ or 74 lb. out of every 100 lb. of seed.}$$

The actual cost per lb. of pure germinating seed is ascertained as follows:—

$$\frac{\text{Cost per 100 lb.}}{\text{Pure germinating seed}} = \text{Cost per lb. of pure germinating seed, i.e., seeds that will grow.}$$

Thus the first sample costs—

$$\frac{\pounds 7\ 10\ 0}{95} = 1/7 \text{ per lb.}$$

and the latter costs—

$$\frac{\pounds 6\ 13\ 4}{74} = 1/10 \text{ per lb.}$$

Thus the "cheaper" line is actually 3d. per lb. dearer than the "dearer" line—when the actual amount of seed that will grow is taken as the basis of calculation—and, after all, the seeds that will produce plants are what the farmer should be interested in.

Taking 1 lb. of average lucerne seed as containing 210,000 seeds, each lb. of seed as purchased should in the case of the 1s. 6d. per lb. seed produce 199,500 plants, and the 1s. 4d. per lb. seed 155,400 plants.

If these two samples were sown at the rate of 12 lb. per acre of pure germinating seed—the actual seed that will grow—100 lb. of the "1s. 6d." seed would plant approximately eight acres, and 100 lb. of the "1s. 4d." seed would plant approximately six acres.

Hard Seeds.—Hard seeds are those of which seed coats are so impervious to water as to delay germination, but because such seed would germinate to some degree when placed in the soil, some consideration is given to including them in the germination count.

In the case of lucerne, cowpeas, rice beans, and crotalarias, all the hard seeds are included in the germination. Half the hard seeds in red clover and one-third in the case of other legumes are included in the germination count.

Because of the very large proportion of hard seeds, and difficulties associated with germination tests brought about by the presence of moulds, the seeds of Mauritius and Velvet beans are abrased before the test is made.

Sampling of Seeds.—Great care is necessary when obtaining a sample for analysis, the objective being to draw from the bulk a sample truly representative of such bulk, *irrespective of any difficulties which may be encountered,* and then to mark the sample in a way which definitely connects with the bulk.

It should always be ascertained whether the whole consignment has a common origin. A separate sample should be taken for each of the following:—

(*a*) Seeds of different kinds;

(*b*) Seeds of the same kind from different origins;

(*c*) Seeds of the same kind bearing different brands or marks on the containers.

It is most important that each portion taken from a bag should be examined to see if it corresponds with the other portions which together are to comprise a sample. For instance, if, when taking a sample of seed there is an observed difference in the colour, size, or appearance of the seed, or the presence of insects or material other than seed, then each difference should be represented by a separate sample; this would necessitate the examination of every bag in the consignment, and a classification of all bags into groups of similar types—one sample representing each different type.

Seeds unlike sugar, flour, and other such commodities are not standard products of a factory. Seeds are liable to vary from bag to bag. Even a consignment from one farm may sometimes vary, moreover, no two fields necessarily produce seed of equal quality. Therefore, if only one sample is sent as representing a mixture of two or more lots of seed, good seed may be condemned or poor quality seed may be passed. Sampling must include intelligent examination and, if necessary, grouping of the portions which are drawn to comprise the sample or samples.

In cases where variations in a consignment are noticed—such as warrant extra samples—then the particular bags from which the various samples are drawn should be marked, either singly or in groups, with identification marks such as A, B, C, D, &c., to correspond with the various samples which should be similarly distinguished.

The weights of samples specified in this article are a minimum: larger quantities may be obtained. The practice of extracting the overweight from a sample found to be slightly in excess of the minimum required, cannot be too strongly condemned.

When drawing a sample from a large number of bags, it is usually necessary to obtain far more than the minimum weight prescribed—in which case the sample should be thoroughly mixed and a suitable portion extracted as the final sample. This breaking down of large samples is dealt with later.

Because of the unsatisfactory position in respect of samples, all certificates and reports relating to samples submitted for examination are marked as follows:—

The figures set out hereon relate only to the analysis of the sample as received and are not a guarantee by the Department of Agriculture and Stock as to the bulk.

Certificates relating to samples drawn by inspectors of the Standards Branch do not bear this statement.

Common errors involved in sampling include the following:—

(*a*) Samples have been drawn from far too small a number of bags.

(*b*) Some samples have obviously contained seeds drawn from two or more bulks of different origin.

(*c*) The marking of the sample has been insufficient to enable correct identification of the bulk at a later period.

Drawing Samples.—The usual method of drawing a sample is by means of a trier—a brass or steel tube with a sharpened end—which should be inserted to its full length into each bag and a small quantity of seed drawn off.

When sampling seed which does not run—such as Rhodes, Paspalum and Prairie—a trier is useless; therefore, each closed bag should be cut, an "L" shaped incision about 2½ inches by 2½ inches being required. The hand should be inserted through the hole and a portion obtained for the sample.

To ensure that a truly representative sample is obtained, approximately equal parts should be drawn alternatively from the top, middle, and bottom of the bag. In normal practice, the proportion of bags to be sampled is as follows:—

1 to 19-bag lots—A portion from each bag.

20 to 39-bag lots—A portion from each of not less than 20 bags.

40 to 59-bag lots—A portion from each of not less than 28 bags.

60 to 79-bag lots—A portion from each of not less than 32 bags.

80 to 99-bag lots—A portion from each of not less than 36 bags.

100 to 199-bag lots—A portion from each of not less than 40 bags.

200 bags and over—A portion from each of not less than 20 per cent. of the total number of bags.

Not less than a trier full of seed or a handful should be drawn from any one bag.

As indicated earlier, if it is observed when drawing samples that great variation occurs in the bulk, two or more samples should be obtained, each from bags of which contents are similar, and representing the variations which may have been noticed. These different lots should be marked with distinguishing marks, and the samples marked similarly.

Samples forwarded for examination should be of the following minimum weight:—

Kind of Seed.	Weight Required.
Barley	8 oz.
Beans	8 oz.
Beet	½ oz.
Cabbage	½ oz.
Canary	4 oz.
Carrot	½ oz.
Couch Grass	2 oz.
Cowpeas	8 oz.
French Millet	4 oz.
Grasses	2 oz.
Japanese Millet	4 oz.
Lucerne	4 oz.
Maize	8 oz.
Mauritius Beans	1 lb.
Millets	4 oz.
Molasses Grass	2 oz.
Oats	8 oz.
Onion	½ oz.
Panicum	4 oz.
Paspalum	2 oz.
Peanuts	1 lb.
Peas	8 oz.
Prairie Grass	2 oz.
Radish	½ oz.
Rhodes Grass	2 oz.
Rye Corn	8 oz.
Sorghum	4 oz.
Sudan Grass	4 oz.
Tares	8 oz.
Tomatoes	½ oz.
Turnip	½ oz.
Vegetable seeds in made up packets	5 pkts.
Wheat	8 oz.
White Panicum	4 oz.

In the case of seeds not mentioned, the weight set out for the seed of nearest size should be forwarded.

In the case of seeds obviously containing weed seeds or other impurities, not less than double the weight mentioned should be sent.

Where seeds are stored loose in bulk, the samples should be taken from various parts of the heap or bin, and should be of the like proportion, as nearly as can be fairly estimated, as would be required if such seed were in bags, so that a representative sample of the whole bulk is obtained.

In the Seed Testing Station great pains are taken to ensure absolute accuracy of work. It therefore follows that all this care is wasted unless the person forwarding samples for examination takes some trouble to ensure that the samples drawn truly represent the bulks from which they are obtained.

After a sample has been drawn as indicated, it should be emptied out on to a large piece of paper, thoroughly mixed; then a quantity not less than the prescribed weight for the particular kind of seed should be drawn for purposes of forwarding to the Seed Testing Station. A duplicate sample should be kept for reference.

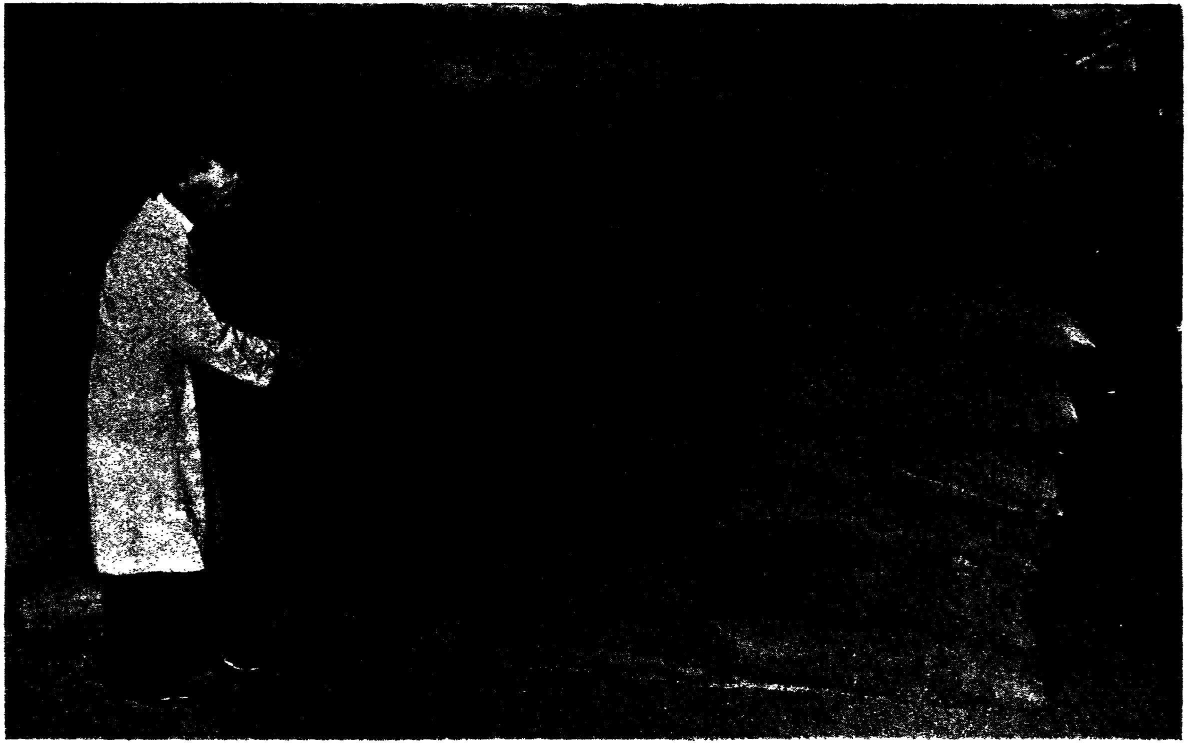


Plate 105.

DRAWING OFFICIAL SAMPLES.—Note the trier marks in the top, middle, or bottom of the bags. The trier holes have been outlined with marking ink for purposes of demonstration; actually the holes left when rubbed with the point of the trier almost seal themselves up, and are practically unnoticeable.

Breaking Down Large Samples.—To reduce large samples of seed, the following procedure should be closely adhered to:—

1. After drawing a representative sample from the required proportion of the bags or bulk, place the seed on to a large level sheet of paper, preferably on a table or bench.
2. **Mix the seed thoroughly together by means of a spatula, plasterer's knife or large knife blade, taking care the blade is inserted into the heap close to the paper, thereby lifting any small seeds, &c.,** before turning the blade over to form another heap. This should be done until all the seed has been turned over at least three times. Avoid mixing with the fingers, as this allows small seeds and fine material to collect at the bottom of the heap. **This fine material must be lifted up on the blade and mixed through the sample.**

Now proceed to divide the sample by levelling it out and dividing it into four approximately equal parts, simply by drawing the spatula or knife through the heap from top to bottom and left to right.

Now take the top right-hand portion and the bottom left-hand portion, place them together on a sheet of paper, and keep as the sample. The other two portions should be mixed together and retained as a check sample.

It is obvious that if a portion is rejected this procedure will reduce the size of the sample drawn. After mixing again, the dividing procedure can be repeated to further reduce the size, and so on, if necessary. Too big a reduction of size is not recommended.

A sample, after mixing and dividing, would appear somewhat as follows:—

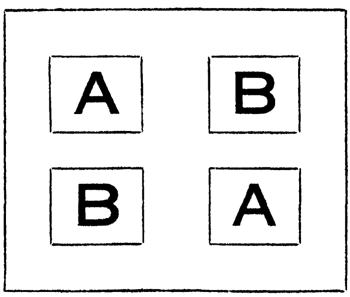


Plate 106.

Portions A, mix and keep as check samples.

Portions B, mix and forward for analysis.

Where samples are taken by inspectors, the Act requires the final sample to be in three separate packets, and a more complicated method of mixing and breaking down is used.

In the accompanying illustration of an inspector drawing an official sealed sample (Plate 105), it will be observed that the stack is

numbered (faintly) 18370. The marking of the packets—official sealed samples are divided into three parts, one for the vendor, one for analysis, and the third is retained by the inspector—would be as follows:—

"Sample of Oats drawn from 50 bags representing a total of 120 bags marked 18370.

Ex. S., Farmer of Oatville.
Vendor, A. Seedseller, Summertown.
7th February, 1947."

Sealing is carried out by means of lead seals and sealing pliers which emboss certain marks on the seals.

Marking of Samples.—All samples should be plainly written on in ink, setting out the undermentioned particulars:—

Sample of seed drawn from bags representing a total of bags.

Bags marked:—

Purchased from of on

Name of sender:

Address:

Date:

Examination of samples without name and address of sender cannot be undertaken.

Samples should be addressed as follows:—

Seed Sample for Examination.
Seed Testing Station,
Department of Agriculture and Stock.
BRISBANE.

Special care should be taken to securely fasten the sample. The examination of samples which have been opened in transit is useless for any determination.

Fee and Covering Letter.—A covering letter, enclosing the prescribed fee, should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The fee for a copy of the result of any examination of any seeds shall be as follows:—

1. 2s. 6d. per certificate, or
2. (*a*) £3 10s. for the first fifty certificates, and thereafter 1s. per additional certificate during the twelve months ending 30th June—providing the sum of £3 10s. shall be paid in advance;

   (*b*) In the event of any person claiming a refund of fees paid under 2 (*a*) on account of the number of certificates being less than fifty, such refund shall consist of the amount left after the charge of 2s. 6d. per certificate has been made.

Free Examination.—Samples representing seeds purchased by farmers for their own sowing are examined free of charge, providing that the full particulars as above are marked on the sample, and a covering letter stating the purpose for which the seed is to be used is sent.

Complaints.—In the case of any complaints regarding analytical purity or germination, the buyer should at once send a sample of the seed, marked with the particulars as set out, together with a covering letter to the Department advising of the despatch of the sample; this will be examined free of charge.

Examine Goods on the Day of Delivery.—Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilizers, pest destroyers, veterinary medicines or stock foods, to write immediately to the Department of Agriculture and Stock, Brisbane, in order that the matter may be immediately investigated.

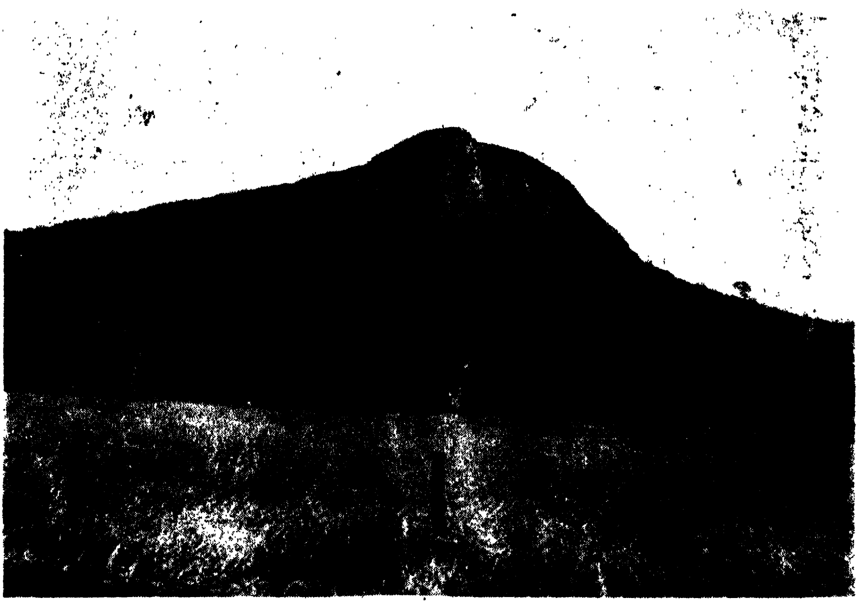


Plate 107.

MOUNT GREVILLE FROM KINGPAH, NEAR MOOGRA, WEST MORETON, QUEENSLAND.

Empire Preference on Rural Products—What it has meant to Queensland.

By OFFICERS OF THE DIVISION OF MARKETING.

SUMMARY.

THE United Kingdom has always been by far the largest and best overseas market for Queensland rural products, and sales of such products in this market in 1938-39 accounted for no less than 13 per cent. of this State's gross income, excluding the value of the services incidental to producing and shipping them. It is obvious, therefore, that the prosperity of the State as a whole is likely to be adversely affected by downward revision or abolition of Empire preferences at present applicable to such products, unless the State obtains a compensating gain in a general world trade rearrangement.

In the year immediately preceding the disruption of normal trade by the war (1938-39), the value of Empire preferences to the major rural industries in Queensland amounted to approximately £A4,000,000, made up as follows:—

Sugar.

In 1938-39 Great Britain absorbed 88 per cent. of Australia's sugar exports and Canada 11 per cent. The value of the preference accorded to Australian sugar on the United Kingdom and Canadian markets in that year was £A1,830,152 and £A293,300 respectively. Queensland production amounts on the average to about 95 per cent. of the total Australian production so that Australia's exports of sugar may be reckoned as coming entirely from Queensland.

Butter.

In 1938-39, before the effects of war became operative, exports of Queensland butter amounted to 81 per cent. of the total factory production, and the monetary value of the Empire preference accorded these exports was approximately £A1,040,000.

Cheese.

Queensland cheese exports to Great Britain for the year 1938-39 were valued at £A232,862, on which the tariff preference amounted to approximately £A35,000.

Eggs.

In 1938-39, the monetary value of Empire preference to the Queensland poultry industry was approximately £A10,500. During the war years, however, egg production increased to such an extent that the surplus now available for export, including processed eggs, is more than twice what it was in 1938-39, and the monetary value of the preference has increased proportionately.

Meat.

Beef and beef products accounted for 90 per cent. of Queensland's exports of meat to the United Kingdom prior to the war. In the year 1938-39 tariff preference on beef represented a value of £A740,721.

Canned Fruit.

Relative to supplies from foreign sources, the monetary value of the preference accorded Queensland canned fruit imported into Great Britain and Canada in 1938-39 is estimated at £A7,000 and £A4,800 respectively, or approximately one-sixth of the f.o.b. value of the exports in that year.

GENERAL OUTLINE.

Rural production has always occupied a position of major importance in the economy of Queensland, and, immediately prior to the war, it represented more than a quarter of the annual gross value of goods and services in this State. Moreover the value of the rural products exported at this time amounted to more than half the gross value of the total produced.

The United Kingdom has always been by far the best overseas market for Queensland rural products; in 1938-39, the last financial year before the war, the gross value of all rural products shipped to this market was £19,554,778, or 74.5 per cent. of the total value of overseas exports of rural products in that year. In other words, exports of rural products to Great Britain accounted for 13 per cent. of Queensland's gross income in 1938-39, apart from the value of the services incidental to producing and shipping them.

These and other relevant facts, which are set out in Table 1, illustrate the extent to which the prosperity of the State as a whole may be influenced by the revision or abolition of Empire Preference on rural products.

TABLE 1.

TABLE SHOWING RELATIONSHIP OF GROSS VALUE OF EXPORTS OF RURAL PRODUCTS FROM QUEENSLAND TO THE UNITED KINGDOM (COLUMN "D") TO GROSS VALUE OF (a) ALL GOODS AND SERVICES, (b) TOTAL RURAL PRODUCTION, AND (c) TOTAL OVERSEAS RURAL EXPORTS.

Year.	(a) Gross value of Goods and Services.	(b) Gross value of Rural Production.	(c) Gross value of Rural Production Exported.	(d) Gross value of Rural Production Exported to the United Kingdom.
	£A.	£A.	£A.	£A.
1934-35	116,200,000	32,395,240	16,965,186	10,925,000
1935-36	123,000,000	33,452,420	17,246,326	10,621,295
1936-37	132,100,000	36,665,661	20,292,171	12,313,075
1937-38	143,500,000	42,766,346	23,520,687	16,204,171
1938-39	150,400,000	45,217,176	26,264,668	19,554,778

Almost the whole of the rural products exported to the United Kingdom from Queensland comes under the following five categories: dairy products, wool, meat products, sugar and fruit. In 1938-39, the value of the products included in these five categories accounted for almost 99 per cent. of the total rural exports to this market.

Table 2 shows the annual value of the exports from Queensland to the United Kingdom of each of the above classes of products during the period 1932-33 to 1939-40.

Reference to the Table will show that the value of the rural products exported annually from Queensland to the United Kingdom increased substantially in six of the seven years immediately preceding

the war. The exception was 1935-36, when there was a decline of 3 per cent. from the total of the previous year, due to a drop in the value of wool, meat and fruit shipments. Throughout the period under review the most striking increase was made with respect to dairy products which, in 1938-39, were easily first in importance and accounted for almost 40 per cent. of the value of the rural products exported to the United Kingdom in that year.

TABLE 2.

Year ended June 30th.	Dairy Produce. (a)	Meat Products.	Wool.	Sugar.	Fruit.	Total.
	£A.	£A.	£A.	£A.	£A.	£A.
1932–33 ..	2,983,887	1,683,040	1,738,229	1,111,458	44,553	7,487,719
1933–34 ..	3,341,085	2,027,379	2,925,667	2,093,878	58,414	10,446,423
1934–35 ..	3,780,631	2,673,726	2,587,045	1,837,495	29,747	10,907,892
1935–36 ..	3,822,773	2,431,018	2,189,699	2,131,894	28,752	10,604,749
1936–37 ..	3,146,276	3,179,192	3,510,049	2,421,705	23,387	12,281,917
1937–38 ..	4,604,765	4,433,383	3,780,197	3,325,470	34,628	16,178,459
1938–39 ..	7,671,376	4,531,379	3,381,958	3,685,747	60,347	19,330,821
1939–40 ..	6,606,718	5,341,812	7,141,418	4,231,254	87,559	24,271,131

(a) Includes Butter, Cheese and Eggs.

While there were various causes contributing to the spectacular rise in the value of dairy and other rural products exported from Queensland to the United Kingdom in the years before the war, it would appear that the Ottawa Agreements Act which came into operation late in 1932 was a determining factor in this connection. Until other arrangements are made, this Act provides, with respect to dairy produce, for the free and unrestricted entry into the United Kingdom of eggs, butter, cheese and other poultry and milk products from Australia, New Zealand, Newfoundland and Southern Rhodesia. Since imports of dairy products entering the United Kingdom from foreign countries are dutiable at prescribed rates, the effect of the Ottawa Agreement has been to give Australian dairy produce a measure of preference on the British market over imports from non-Empire countries.

Apart from the dairying industry, however, Empire Preference granted under the Ottawa and other Trade Agreements has also assisted materially in the development of the sugar, meat and fruit industries in Queensland. The effect of Empire Preference on overseas trade in the major products of these industries is reviewed in the following pages.

DAIRY PRODUCTS.

Butter.

For many years, the United Kingdom market has absorbed practically the entire exportable surplus of dairy products from Queensland.

Table 3 shows the quantity and value of butter exported from Queensland to Great Britain in each of the years 1932-33 to 1939-40 inclusive, as well as total factory production for each of those years:

It will be noted from the Table that exports of butter to Great Britain reached a record height in 1938-39. Exports in that year were equal to more than 80 per cent. of the State's output of butter from factories. When it is taken into account that the value of Factory

butter produced in Queensland was in that year more than 85 per cent. of the value of the State's total output of dairy products (excluding eggs) the paramount importance of the United Kingdom market is evident. Without this outlet for such a large proportion of our butter production the structure of the dairying industry would be undermined.

TABLE 3.

Year ended 30th June.	Total Factory Production.	Exports to Great Britain.		
		Quantity.	Percentage of Total Exports.	Value.
	Lbs.	Lbs.	Per cent.	£A.
1932-33	93,312,321	73,705,408	96·29	2,756,839
1933-34	110,607,700	94,293,584	96·14	3,123,662
1934-35	133,402,841	97,763,125	95·72	3,511,752
1935-36	115,703,863	72,836,000	95·55	3,643,178
1936-37	84,401,372	52,048,584	96·59	2,988,492
1937-38	114,941,221	72,561,661	96·67	4,379,228
1938-39	154,377,535	124,571,124	97·67	7,343,482
1939-40	139,795,042	102,720,552	96·23	6,269,801

Whilst the total quantities of Queensland butter disposed of in overseas markets other than Great Britain increased by only 136,463 lbs. from 1932-33 to 1938-39, it is significant that the quantity of Queensland butter which the United Kingdom market was able to absorb in 1938-39 was almost 51,000,000 lbs. in excess of what it was in 1932-33.

The removal of the preferential tariff on butter, which is at present enjoyed by Empire countries, could be expected to result in a substantial reduction in returns to Queensland producers. In the peak period year of 1938-39, for example, the removal of the preference would have resulted in a reduction of more than £A1,000,000 in the total value of butter exported from Queensland to Great Britain in that year, equivalent to 18s. 9d. per cwt.

War conditions brought about a marked change in the disposal of dairy products. After the entry of Japan into the war, Australia undertook the responsibility of providing food for Allied troops in the South West Pacific area. Under this arrangement, Australia supplied butter to American troops based in the South West Pacific, and in return America exported butter to Great Britain. For this reason, exports of butter from Queensland to Great Britain fell to approximately 37,500,000 lbs. in 1941-42; 44,900,000 lbs. in 1942-43; 39,600,000 lbs. in 1943-44; 31,600,000 lbs. in 1944-45 and 60,800,000 lbs. in 1945-46.

An Agreement is in existence at the present time whereby the Government of the United Kingdom has contracted with the Commonwealth Government for the purchase of Australia's exportable surplus of butter. This contract provides Australia with an assured market at fixed prices for the whole of her exportable surplus of butter until 30th June, 1948, but the position beyond that date is not clear. There is considerable scope in Queensland for the further development of the dairying industry, but the retention of British preference after the expiration of the present contract would appear to be essential if some measure of price stability is to be provided for the products of the industry.

War conditions were responsible in a large measure for the falling off in butter production during the years 1941-42 to 1944-45. The highest production reached in those years was in 1942-43 when approximately 111,500,000 lbs. of butter were produced in factories, as compared with more than 154,000,000 lbs. in the immediate prewar year 1938-39. With the termination of the war, it is reasonable to assume that production in the industry, given good seasons, will quickly build up to the 1938-39 level. However, it would appear from past experience that the extent to which expansion can take place beyond that level will depend, in no small measure, on the continuance of the preferential tariff at present in operation.

Cheese.

Table 4 shows the quantity and value of cheese exported from Queensland to Great Britain in each of the years 1932-33 to 1939-40 inclusive, as well as total factory production for each of those years:

TABLE 4.

Year ended 30th June.	Total Factory Production.	Exports to Great Britain.		
		Quantity.	Percentage of Total Exports.	Value.
	Lbs.	Lbs.	Per cent.	£A.
1932–33	11,153,825	6,362,529	97·48	145,431
1933–34	13,937,788	6,465,979	97·44	140,203
1934–35	13,525,380	7,636,713	97·67	156,574
1935–36	10,018,618	3,288,430	94·48	75,622
1936–37	7,771,926	1,473,617	83·39	38,101
1937–38	11,942,225	5,586,168	96·63	149,540
1938–39	15,749,103	9,240,578	97·39	232,862
1939–40	13,841,405	8,473,266	96·02	241,133

Whilst cheese production in Queensland is not of the same relative importance as butter, developments which took place during the war years have underlined the importance of preference on the United Kingdom market for this commodity, since cheese from Empire countries is admitted into Great Britain duty free as against a duty on imports from foreign countries of 15 per cent. ad valorem.

Despite manpower and material shortages during the war, cheese production in Queensland rose to record levels, due to the fact that, because of the lack of refrigerated shipping space and a shortage of protein foodstuffs, Great Britain requested greater supplies of cheese in lieu of butter. As a result of an intensive campaign, supplies of milk were diverted from butter to cheese production and new factories were erected to manufacture the milk into cheese.

As in the case of butter, the United Kingdom Government has contracted with the Commonwealth Government to purchase the whole of Australia's exportable surplus of cheese. This contract virtually guarantees a market for Australia's exportable surplus of cheese at prices determined in advance, until 30th June, 1948. If, after that date, exports to Great Britain are to be sold on the open market, it is considered that further expansion of the cheese industry or the maintenance of the increased production achieved during the war years, will depend in no small measure on the retention of British preference.

Eggs.

Queensland eggs were first shipped to the United Kingdom in quantity in 1928-29. Prior to this time, overseas exports of this commodity were limited to small shipments to Papua and neighbouring islands. Ever since the trade with Great Britain was established, however, this market has absorbed almost the entire exportable surplus from Queensland and it is likely to continue as the chief overseas outlet for both eggs-in-shell and egg products. Table 5 shows the quantity and value of eggs exported from Queensland to Great Britain in each year from 1929-30 to 1939-40 inclusive.

TABLE 5.

EXPORT OF EGGS TO UNITED KINGDOM.

Year ended 30th June.	Quantity.	Value.	Year ended 30th June.	Quantity.	Value.
	Dozens.	£A.		Dozens.	£A.
1929-30 ..	919,440	65,215	1935-36 ..	2,155,230	103,973
1930-31 ..	831,150	40,779	1936-37 ..	1,900,019	119,683
1931-32 ..	768,390	39,379	1937-38 ..	1,249,500	75,997
1932-33 ..	1,308,090	81,617	1938-39 ..	1,400,040	95,032
1933-34 ..	1,398,510	77,220	1939-40 ..	1,580,510	95,784
1934-35 ..	1,944,810	111,555			

Prior to the war, most of the commercial egg production in Queensland took place in the south-eastern portion of the State where marketing of the product is under the control of the Egg Marketing Board. Subsequent to Japan's entry into the war, the Commonwealth Government gave strong encouragement to the expansion of the egg industry throughout Australia in order to meet the requirements of the Australian and Allied Armed Forces. As a result of this production drive, the Egg Marketing Board was required to handle more than twice as many eggs in 1945-46 as it did in pre-war years. Table 6 shows the increase in production which has taken place in the Egg Marketing Board's territory during the war:

TABLE 6.

DELIVERIES OF EGGS TO THE EGG MARKETING BOARD AND ITS AGENTS.

Year ended 30th June.	Quantity in Dozens.	Year ended 30th June.	Quantity in Dozens.
1938-39	4,754,091	1942-43	7,223,676
1938-40	5,355,875	1943-44	6,419,554
1940-41	6,215,747	1944-45	8,862,842
1941-42	7,044,029	1945-46	11,094,812

While there has also been a substantial increase in commercial egg production in other parts of the State during the war years, particularly in the Central and Northern coastal districts, approximately 75 per cent. of the eggs which will be marketed in Queensland this year will be produced within the Egg Marketing Board's territory. In this area alone, the exportable surplus during the latter half of 1946 (eggs-in-shell and egg pulp) represented approximately 50 per cent. of the eggs

handled by the Board in this period and amounted to 3,203,250 dozen (106,775 cases) of an estimated value f.o.b. Brisbane of £266,938. This was more than twice as great as the surplus for the whole of 1938-39.

Since the end of the war, exports of both eggs-in-shell and egg products from Australia to Great Britain have been made under contract with the British Government. The present contracts continue until June, 1948. The allocation among States of export shipments to the United Kingdom is under the jurisdiction of the Commonwealth Egg Controller and it is expected that the contracts which have already been entered into will provide a market for every surplus egg of exportable quality which may be produced in Australia during the next twelve months. Consequently, the question of preference during this period does not arise. From June, 1948, onwards, however, the position is uncertain and the extent to which Queensland, in common with the other States, can maintain its present level of production beyond that time will depend in large measure on British Government policy with respect to tariffs and quota restrictions on both shell eggs and egg pulp. Under the Ottawa Agreement, egg products from Australia were granted free and unrestricted entry into the United Kingdom, along with those from certain other Empire countries including New Zealand, and Southern Rhodesia, "for the three years from 15th November, 1932, and subsequently until further arrangements are made," while imports of these products from foreign countries were dutiable at the following rates:

Eggs-in-shell:

Not exceeding 14 lb. per great hundred* ..	1/- per g.h.
Over 14 lb. but not exceeding 17 lb. per great hundred	1/6 per g.h.
Over 17 lb. per great hundred	1/9 per g.h.

* Great hundred—10 dozen.

Shell eggs exported from Australia to the United Kingdom are timed to arrive at British ports between September and January. At this time of the year domestic production is insufficient to meet the demand and Australian supplies compete mainly with refrigerated imports from New Zealand, South Africa and Canada among Empire countries, and with those from the Argentine, the United States, Morocco, Russia and Scandinavia among foreign countries. The preference accorded to the Empire product over that from foreign countries, under the above scale of duties, represents from 3s. to 5s. 3d. per case, depending on the size of the eggs. On the values prevailing in the 1937-38 season, this preference was equivalent to about 11 per cent., or 1.6d. per dozen, on eggs exported from Queensland to Great Britain.

As in the case of shell eggs, the United Kingdom is also by far the largest importer of egg pulp. Prior to the war, 97 per cent. of its supplies of this commodity were drawn from China and only a fraction of one per cent. from all Empire countries combined, none at all being supplied by Queensland. From September, 1946, to January, 1947, however, the Egg Marketing Board shipped 626,400 lb. of frozen egg pulp to Great Britain, as part of the quantity which Australia has contracted to supply the British Ministry of Food. During the currency of this contract, which, as in the case of that for shell eggs, expires at the end of June, 1948, the price to be paid for pulp will give a return approximately equivalent to that paid for shell eggs. Pulp exported under contract will have free entry into the United Kingdom, as was the case with all Empire-produced pulp before the war, in contrast to

pulp from foreign origin which was dutiable at the rate of one-halfpenny per lb. This low rate of duty, which is equivalent to less than one-halfpenny per dozen shell eggs, possibly accounts in large part for the overwhelming predominance of foreign imports of egg pulp into Great Britain over those from Empire countries in pre-war years. If Australia, subsequent to June, 1948, is to maintain exports of egg pulp to the United Kingdom in the volume which she has contracted to supply in the interim it will probably be necessary for the tariff on foreign imports to be raised to a level equivalent to that applicable to eggs-in-shell, that is, approximately 1.6d. per lb. In this connection, it should be noted that prices for egg pulp in the United Kingdom are not subject to the wide seasonal variations which occur in the case of shell eggs, so that imports take place the year round.

Having regard to the magnitude of the egg surplus which will be available for export annually from Australia if the level of production which was reached in 1945-46 is maintained—in the case of Queensland, approximately 50 per cent. of total marketable production—it is clear that any downward revision of the Empire Preference on eggs would, on the termination of the present contracts in June, 1948, seriously endanger the financial stability of the poultry industry throughout the Commonwealth. Even if production costs remain as at present, the increase in equalisation payments which would become necessary in the event of the abolition of the existing British tariff on eggs of foreign origin would reduce the producer's margin of profit on both domestic and export sales to a very low level, and might even wipe it out entirely. As the needs of the Empire and of the Allied nations generally have been responsible for the great increase which has taken place in egg production in Queensland during recent years, it is considered that the industry has a strong claim not merely for the retention of but also for an increase in Empire preference on eggs and egg products.

MEAT PRODUCTS.

International Meat Trade.

The international meat trade consists chiefly of exports from the Southern to the Northern hemisphere where the United Kingdom has been almost the sole market for beef, mutton and lamb. Germany, prior to 1930, imported some beef but subsequently ceased to do so.

The chief supply source is South America (Argentina, Brazil and Uruguay). While Australia is the largest Empire exporter it did not provide more than approximately fifteen per cent. of the imports of meat into the United Kingdom prior to the war.

In the past the United Kingdom market has been the governing factor so far as the development of the Queensland meat industry is concerned.

Mutton and lamb and pigmeats are not dutiable by the United Kingdom. Foreign tariffs on beef and veal are as follows:

Chilled Beef	$\frac{3}{4}$d. per lb.
Frozen and Salted Beef and Veal	$\frac{2}{3}$d. per lb.
Boned and Boneless Beef and Veal and Edible Offals	20 per cent. ad valorem
Canned Beef	20 per cent. ad valorem

Australian meat entering the United Kingdom is not liable to tariff but is subject to various quota agreements from time to time as outlined below.

The Nature of the Queensland Trade.

Queensland meat exports to the United Kingdom represent seventeen per cent. of the total value of exports of rural production from Queensland. Approximately half of the total meat produced is exported to this market which absorbs over ninety per cent. of Australia's meat exports. In 1938-39, Queensland contributed fifty-two per cent. of such exports.

Of the meat exported to the United Kingdom from Queensland beef is the most important, as is indicated by Table 7 which shows the quantities of the various types of meat exported to Great Britian for the years 1936-37 and 1937-38:

TABLE 7.

Class of Meat.	1936-37.	Percentage of Total.	1937-38.	Percentage of Total.
	Tons.	Per cent.	Tons.	Per cent.
Chilled quarter beef	17,703	18·60	27,765	23·45
Frozen quarter and piece beef	56,216	59·05	59,783	50·49
Boneless beef	6,116	6·42	10,204	8·62
Boneless veal	1,892	1·99	2,799	2·36
Other beef and veal	346	0·36	415	0·35
Sundries	4,573	4·80	5,642	4·76
	86,846	91·22	106,608	90·03
Lamb	380	0·40	383	0·32
Mutton	2,141	2·25	2,481	2·10
Sundries	27	0·03	40	0·03
	2,548	2·68	2,904	2·45
Porkers	3,168	3·33	2,775	2·35
Baconers	1,062	1·12	3,801	3·21
Sundries	29	0·03	39	0·03
	4,259	4·48	6,615	5·59
Miscellaneous	1,542	1·62	2,285	1·93
	95,195	..	118,412	..
	45·58 Per cent. of Aust. Total.		49·53 Per cent. of Aust. Total.	

The Ottawa Agreements.

Since 1931-32, the year of the Ottawa Agreement, exportations of meat from Australia to the United Kingdom have been subject to various agreements between the two Governments.

The basis of agreement at Ottawa, as previously ratified by both Governments, in regard to meat was as follows:—

Britain agreed to:—

(1) Progressively restrict importations of foreign frozen beef carcases, boned beef, mutton and lamb until the middle of 1934 to thirty-five per cent. of the 1931-32 imports. After that period thirty-five per cent. restrictions to remain during period of Agreement.

(2) Limitation of foreign chilled beef imports to the volume of imports for year 1931-32 (viz. 440,000 tons) annually during period of Agreement.

Australia agreed to:—

(1) Limit exportation of frozen beef to U.K. during 1933 to an amount exceeding the exportation during 1931-32 by not more than ten per cent. After 1933 no limitation of exports.

(2) Limit exportation of mutton and lamb to U.K. during 1933 to that of the year 1931-32. After 1933 no limitation of exports.

The Commonwealth Government in carrying out the terms of the Ottawa Agreement limited the quantity of frozen mutton, lamb, beef and veal exportable to the United Kingdom during 1933. Queensland was allotted eight per cent. of the mutton and lamb and 82 per cent. of the beef and veal.

In 1934, the United Kingdom Government issued a white paper on "The Livestock Situation" which called attention to the decline in the livestock industry of that country and which announced that it was the firm intention of His Majesty's Government to safeguard the position of the United Kingdom livestock industry. Arrangements were subsequently made to provide for importations of Australian meat regulated in accordance with the absorptive capacity of the United Kingdom market. At the same time an agreement between the British Government and Argentina provided that a ten per cent. reduction of chilled beef would be imposed.

Exports of meat from Queensland to the United Kingdom from 1932-33 to the outbreak of war are shown in Table 8:—

TABLE 8.

MEAT EXPORTS TO THE UNITED KINGDOM FROM QUEENSLAND.

Year.	Beef.		Lamb and Mutton.	Pork.	Total.
	Frozen. (including Veal).	Chilled.			
	Tons.	Tons.	Tons.	Tons.	Tons.
1932–33 ..	(a)	(a)	4,251	1,368	50,951
1933–34 ..	(a)	(a)	2,191	2,142	62,986
1934–35 ..	63,662	8,277	5,022	3,895	80,856
1935–36 ..	50,329	9,774	1,490	5,154	66,747
1936–37 ..	61,935	17,568	2,533	4,262	86,298
1937–38 ..	74,277	25,390	2,864	6,507	109,038
1938–39 ..	67,626	25,813	1,763	7,923	103,125
1939–40 ..	84,178	5,548	3,294	13,844	106,864

(a) Not available.

The total exports of beef and veal, 1932-33, were 45,332 tons; and 1933-34, were 58,653 tons.

The Wartime Agreement.

As from 1st October, 1939, the British Ministry of Food became the sole purchaser of all meat exported from Australia to the United Kingdom. An Agreement to this effect was entered into by the two Governments. It is to be noted that immediately war was declared, all chilled beef exports ceased and meat of all classes had to be frozen prior to shipment.

The Agreement in existence at present extends from 1st October, 1944, to 30th September, 1948. Sales of meat for export are confined to sales under this contract. The prices as fixed at present apply up to 30th September, 1947, and will also apply subsequently unless either Government requests reconsideration on substantial grounds.

The Progress of the Meat Industry in Queensland.

Except for a rise in cattle numbers after the 1914-18 war the numbers of cattle in Queensland have not varied to any great extent since 1910. The sheep population in Queensland has also been relatively static. However, the export trade has expanded since 1931, particularly as regards pig meats and chilled beef.

The tables appended to the Meat Products section of this Report show the variations that have taken place in livestock numbers and in the quantity of meat of various kinds exported to the United Kingdom from Queensland, from which it will be seen that the two major developments that have taken place relate to the export of frozen pork or bacon carcases and to chilled beef.

The freezing of beef lowers its quality and places Queensland's meat exports at a disadvantage as against chilled beef marketed by Argentina. The latter country commenced exporting chilled beef in 1900, and since 1925 the bulk of their exports of meat to the United Kingdom has been in chilled form.

The advantages of higher prices that would be paid for chilled beef were of some importance subsequent to the last war as meat export prices were not very enouraging from the point of view of the expansion of the meat industry. By 1934, research by the Queensland Meat Industry Board and the C.S.I.R. had paved the way for the inauguration of chilled beef exports from Queensland. Rapid progress was made up till 1939, when this trade was discontinued owing to the war.

An export trade in boneless bobby veal was developed in the 1930's. This enabled dairy farmers to dispose of calves in increasing numbers and annual slaughterings increased from 70,000 in 1929-33 to 250,000 in 1940. The trade was suspended in 1941, but was later resumed.

Rapid expansion has occurred in the pig industry in this State and stock numbers have nearly quadrupled over the last thirty years. In the United Kingdom the fresh pork trade is supplied mostly by the home producer. On the other hand, the great bulk of bacon supplies is imported and since 1930 Queensland has developed a trade in the supply of frozen carcases for curing in Great Britain.

Mutton and lamb have not been of such importance in Queensland. On the bulk of the pastoral country conditions are more suited to wool

production. Some development of quality mutton and lamb production has, however, taken place in the Darling Downs. This has been mainly directed to the home market as up to the present costs have precluded any extensive participation in the export trade.

Further Development.

The extensive pastoral resources of Queensland together with the availability of large areas of undeveloped agricultural lands in a summer rainfall belt where forage crops can be grown will, under suitable conditions of markets and returns, permit a considerable expansion in the meat industries. The Royal Commission on Abattoirs and Meatworks (1945) states in its Report "that when the natural resources of the land reach full development from 9,000,000 to 10,000,000 beef cattle can be depastured within the State." This is double the present cattle population.

The settlement of the reclaimed prickly pear belt of Queensland comprising 20,000,000 acres of rich agricultural and pastoral country, would mean an expansion of the area available for the fattening of stock by feeding of summer fodder crops and natural and introduced pastures. The better quality meats fattened under these intensive methods and the greater regularity of supply will materially assist to overcome some of the disabilities which have affected the meat industry up to the present. Arrangements for drought feeding, transport and treatment works will be made more economical and will permit the delivery of a high quality product on the overseas markets more closely competitive with foreign meat than has been the case in the past.

While the trend of development of the export beef industry is clear in so far as increasing quantities of chilled and frozen beef, veal, canned meats, hides, and tallow, etc., will be available for export, some doubt has been expressed in regard to the economics of fat lamb production in the State (Royal Commission on Abattoirs and Meatworks, Queensland, 1945). However, irrigation projects are contemplated which may lead to the increased production of this product on an economic basis.

The pig industry is of particular importance and is dealt with below.

THE PIG INDUSTRY.

Australia became a regular exporter of pig meats only after the Ottawa Conference. Prior to 1931, intermittent shipments had been made but usually prices did not permit profitable export.

The Ottawa Agreement regarding the regulation of supplies from foreign countries and the Dominions was superseded by the institution of a Bacon Marketing Scheme by the British Government. The scheme aimed at creating a regular market for home producers of bacon pigs and necessitates adjustment of foreign supplies to conform with British bacon factories' requirements after estimated home and Dominion production is provided for. The allocation of this trade to Australia provided for a steady expansion up to 1939.

Supplies from Australia of frozen pork carcases which can be cured by bacon factories in Britain help to fill in the months of slack production in Britain and give factories a chance to maintain production throughout the year and thus reduce overhead. The peak production

period in Queensland, October-March, coincides with the slack period in Great Britain. This trade has led to the development of the treatment of pigs in Central Queensland and has widened the market for producers.

The pig industry has increasingly become an outlet for the marketing of grains, and it might be noted that numbers of pigs slaughtered in Queensland have risen more rapidly than has butter production, indicating that this industry is becoming something more than a sideline to dairying. This is shown in Table 9:—

TABLE 9.

Year.	Pigs Killed.	(a) Butter.	Year.	Pigs Killed.	(a) Butter.
		Lbs.			Lbs.
1931–32 ..	416,715	97,602,853	1936–37 ..	573,981	84,401,372
1932–33 ..	383,543	93,312,321	1937–38 ..	491,832	114,941,221
1933–34 ..	392,732	110,607,700	1938–39 ..	530,453	154,377,535
1934–35 ..	448,469	133,402,841	1939–40 ..	614,339	139,795,042
1935–36 ..	521,664	115,703,863	1940–41 ..	711,557	117,081,269

(a) Factory production.

During the war various agreements were made in regard to the export of pig products and were subject to annual variations according to existing needs, the shipping position and so on. The British Ministry of Food has announced that it will accept Australia's exportable surplus of pigmeats up to September 30th, 1947. The British Government has requested that production for export be concentrated on baconer type pigs and it does appear that the future expansion of the export trade depends upon this type rather than on the lighter weight porker pigs.

General.

From the foregoing outline of the Queensland meat trade it is clear that in the past the development of the industry has been intimately bound up with favourable treatment in the world's most important meat market—the United Kingdom—and, of all Australian States, Queensland has been the most affected by variations in this market.

The value of this preference to Queensland is shown by the following:—

Beef.—Beef and beef products accounted for 90 per cent. of Queensland's exports of meat to the United Kingdom prior to the war. In the year 1938-39 tariff preference on beef represented a value of £740,721 made up as follows:—

	£
Frozen beef	397,888
Chilled beef	225,860
Other beef and veal	116,973
	£740,721

Pigmeats.—Pigmeats are not dutiable by the United Kingdom but imports were subject to the Bacon Marketing Scheme which limited foreign imports to permit both home and Dominion supply ready access

to the market. The value of this preference to the Queensland industry is illustrated by the fact that the value of exports from Queensland to the United Kingdom increased from £67,698 in 1932-33 to £897,037 in 1939-40.

The progress of land settlement in Queensland, in which the rehabilitation of returned men will play an important part, will lead to more intensive methods of stock raising. Better pastures and nutrition, improved methods of disease control and advances in processing and transport will tend towards a product of a high quality. Developments of this nature cannot, however, be expected in the absence of an assured market.

The ability of Queensland to produce bacon carcases and to ship to Great Britain at a period of the year when processing plants are slack, points to the need for every encouragement to be given to this trade by continuing some form of long term agreement such as obtains at present. In this way producers will be encouraged to plan ahead, to establish proper feeding methods, and to develop the type of carcase that is required by the United Kingdom market.

Throughout the meat industry, which is essentially one in which planning has to be on a long term basis, there is a need for stability which will advantage both producer and consumer and which can only be assured by adequate agreement between the industry and its market.

TABLE 10.

EXPORTS OF MEATS FROM QUEENSLAND TO UNITED KINGDOM. 1932-33—1939-40.

Year ended 30th June.	Pork.		Bacon and Ham.	
	Quantity.	Value.	Quantity.	Value.
	Lbs.	£	Lbs.	£
1932-33	3,063,967	67,684	387	14
1933-34	4,797,045	113,907	4,197	97
1934-35	8,723,856	215,659	547	20
1935-36	11,544,173	279,879	23,879	805
1936-37	9,547,791	248,905	11,876	261
1937-38	14,575,714	412,790	59,285	2,745
1938-39	17,746,543	491,550	167,739	5,188
1939-40	31,011,308	888,903	272,611	8,134

Year ended 30th June.	Mutton.		Lamb.	
	Quantity.	Value.	Quantity.	Value.
	Lbs.	£	Lbs.	£
1932-33	8,276,566	94,404	1,244,602	19,384
1933-34	4,605,626	67,428	301,684	6,610
1934-35	10,266,185	176,509	982,574	27,166
1935-36	2,749,008	51,256	587,773	17,459
1936-37	4,817,253	82,172	857,612	24,801
1937-38	5,556,004	95,551	859,499	24,515
1938-39	2,232,559	34,344	1,717,603	46,841
1939-40	4,690,742	67,451	2,687,331	69,831

TABLE 11.

EXPORTS OF MEAT FROM QUEENSLAND TO UNITED KINGDOM.

1932–33—1939–40.

BEEF.

Year ended 30th June.	Frozen Beef.		Chilled Beef.		Veal.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Lbs.	£	Lbs.	£	Lbs.	£	Lbs.	£
1932–33	..	..	..	..	..	..	101,543,944	1,210,517
1933–34	..	..	..	..	..	..	131,383,088	1,524,998
1934–35	139,263,783	1,571,269	18,540,054	268,626	3,338,249	51,677	161,142,096	1,891,572
1935–36	108,235,065	1,317,047	21,894,680	326,114	4,501,270	64,107	134,631,015	1,707,268
1936–37	134,116,839	1,652,593	39,351,292	566,970	4,616,705	65,093	178,084,836	2,284,656
1937–38	159,081,797	2,202,807	56,873,524	940,588	7,298,382	117,149	223,253,703	3,260,544
1938–39	144,591,712	2,207,592	57,820,114	966,336	6,890,542	103,524	209,302,368	3,277,452
1939–40	181,390,009	3,024,531	12,427,472	199,392	7,168,567	126,712	200,986,048	3,350,635

TABLE 12.

EXPORTS OF MEAT FROM QUEENSLAND TO UNITED KINGDOM.

1932–33 – 1939–40.

OTHER MEATS.

Year ended 30th June.	Rabbits.		Poultry.		Tinned Meat.		Salted Meat, &c.		Potted and Concentrate.		Other.		Total Value.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
	Pairs.	£A.	Pairs.	£A.	Lbs.	£A.	Lbs.	£A.	Lbs.	£A.	Lbs.	£A.	£A.
1932–33 ..	908,266	53,892	..	..	322,931	9,201	..	..	..	2,667	4,811,237	78,676	144,436
1933–34 ..	1,153,621	69,699	210	41	128,573	5,497	..	..	..	2,242	5,445,140	92,970	170,449
1934–35 ..	991,363	59,751	214	103	1,204,964	28,155	2,240	46	..	1,575	8,124,322	123,030	212,660
1935–36 ..	763,389	45,533	..	..	1,358,700	33,484	25,984	687	..	3,248	7,818,303	116,575	199,527
1936–37 ..	203,578	8,970	..	..	3,589,642	115,767	..	..	..	..	9,606,500	163,092	287,829
1937–38 ..	53,622	2,579	..	..	5,286,976	171,225	13,104	311	..	5,424	11,432,998	189,593	369,132
1938–39 ..	207,492	8,234	..	..	8,793,642	288,856	..	..	..	4,687	10,548,769	192,487	494,264
1939–40 ..	595,049	30,426	..	..	10,645,297	422,342	..	..	..	3,489	13,258,161	255,610	711,867

TABLE 13.

LIVE STOCK POPULATION—QUEENSLAND.

1931—1939.

At 31st December.	Number of Livestock.		
	Cattle.	Sheep.	Swine.
1931	5,550,399	22,324,278	222,686
1932	5,535,065	21,312,865	213,249
1933	5,781,170	20,072,804	217,448
1934	6,052,641	21,574,182	269,873
1935	6,033,004	18,060,093	304,888
1936	5,950,572	20,011,749	290,855
1937	5,959,165	22,497,970	282,941
1938	6,097,089	23,158,569	325,326
1939	6,198,798	24,190,931	391,333

WOOL.

In the House of Representatives on 30th August, 1945, the Prime Minister announced that the Governments of the United Kingdom, Australia, New Zealand, and South Africa had agreed upon a plan for the post-war marketing of Dominion-grown wool. Consequently, the question of retention of Empire Preference on wool does not arise at this juncture. However, in order that the export position with respect to this commodity may be viewed in relation to that of other rural products, the principles of the wool marketing plan and its method of operation have been summarised as follows:—

During the war, the United Kingdom purchased all Australian and New Zealand wool, and supported the market for South African wool. Resulting from those purchases and from the war-time trading transactions, the United Kingdom Government possesses an accumulated surplus of Dominion-grown wool, amounting to 10,000,000 bales. The plan adopted, in addition to providing for the sale of those accumulated stocks, contains price safeguards for all clips coming forward each year during the period of disposal. During that period, the four Governments will meet yearly and decide, for the following year, the general level of reserve prices for wool, below which sales will not be made either from stocks or from current clips. Arrangements will be made to buy in and hold any wool of current clips which does not find commercial buyers at the reserve prices or better; and to sell, at appropriate prices, wool now in stock and wool bought in during the operation of the plan. The speedy disposal of the accumulated stocks will depend on the continuance of an active trade in wool sufficient to absorb, at not less than the reserve prices, the equivalent of each current clip and some wool from accumulated stocks.

The method of marketing adopted under this plan differs from both the pre-war and the war-time methods. Prior to the war, wool was sold at auction without any intervention by Governments, or any protection of the grower from the vagaries of the market. During the war, the Government used the war-time power of acquisition and paid to growers prices decided by appraisement, and based on the flat rate price paid by the United Kingdom for all Australian wool. Under the plan which has now been adopted the growers' general reserve price takes the

place of the war-time flat rate purchase price. Each grower's wool is appraised, and that appraisement decides his reserve price. Wool is sold at auction, and if the return from auction, after meeting the contributory charge, exceeds the reserve price, the grower reaps the benefit of the market. If the best price offered at auction by a commercial bidder is less than the reserve price, after provision is made for the contributory charge, the organisation buys in the wool and the grower is paid the appropriate reserve price. In each case, the grower meets his selling costs as he did under the war-time system of appraisement and acquisition.

The principal object of the plan is to protect woolgrowers against the serious fall in price which would undoubtedly occur if the accumulated stocks were unloaded on the market indiscriminately. The plan amounts to the underwriting of the income of Dominion wool producers during the next fourteen years or thereabouts. That period is based on an estimated increase of about 20 per cent. in the world's consumption of wool. If the increase exceeds that estimate, the period will be shorter, but if consumption does not increase to that degree, the period will naturally be longer. The plan is, in its effects, an international one, though it is at present confined in its active provisions to Empire countries. It is the first of such plans to be agreed upon for post-war operation.

TABLE 14.

THE FOLLOWING TABLE SHOWS THE WOOL EXPORTS FROM QUEENSLAND TO THE UNITED KINGDOM FOR THE PERIOD 1932–33 TO 1939–40.

Year ended 30th June.	Greasy.		Scoured.		Wool on Skins.		Total Value.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
	Lbs.	£A.	Lbs.	£A.	Lbs.	£A.	£A.
1932-33 . . .	28,216,589	1,077,113	11,036,585	650,799	606,849	10,317	1,738,229
1933-34 . . .	29,704,411	1,925,401	10,569,890	983,614	560,879	16,652	2,925,667
1934-35 . .	35,860,489	1,621,998	12,508,215	955,001	449,914	10,046	2,587,045
1935-36 . .	24,419,010	1,475,960	8,775,317	708,182	151,410	5,557	2,189,699
1936-37 . . .	40,033,598	2,786,575	7,209,193	716,757	148,105	6,717	3,510,049
1937-38 . .	51,299,581	3,058,985	7,534,614	707,909	306,016	13,303	3,780,197
1938-39 . . .	58,773,242	2,741,366	8,454,185	639,230	53,830	1,362	3,381,958
1939-40	102,736,438	6,132,512	10,595 782	1,000,395	324,392	8,511	7,141,418

SUGAR.

Queensland sugar was first exported in any quantity in 1924 and the value of this export trade increased until in the year 1939-40 it exceeded £6,000,000.

Queensland contains 95 per cent. of the total acreage planted to sugar cane in Australia, the remaining 5 per cent. being located in New South Wales. Of the thirty-five raw sugar mills in the two States thirty-two are located in Queensland.

Table 15 shows the production of sugar in Queensland, the total production for Australia, the quantity exported, and the value thereof for the years 1932-33 to 1939-40.

The development of the sugar cane industry in Queensland has been concomitant with the development of the Northern Coastal Belt of this State. The stabilisation of this industry and its protected development in that area were among the outstanding considerations that led to the federation of the Australian States.

TABLE 15.

CANE SUGAR.

Year.	Queensland Production.	Australian Production.	Exports from Australia.	Value of Exports.
	Tons.	Tons.	Tons.	£A.
1932–33	514,027	532,594	187,061	1,490,036
1933–34	638,559	666,145	307,980	2,295,203
1934–35	611,161	640,589	306,497	2,195,893
1935–36	610,080	646,541	300,680	2,758,170
1936–37	744,676	782,834	406,250	3,707,360
1937–38	763,242	810,319	427,184	4,026,698
1938–39	778,064	823,086	443,021	4,177,741
1939–40	891,738	928,621	524,432	6,185,992
8 year average ..	693,943	728,841	362,888	3,354,637

Ever since Federation the Commonwealth Government has encouraged the development of this industry by the imposition of protective tariffs and by legislation and agreements for stabilising the internal price of the commodity.

The development of the industry led to the closer settlement and collateral development of transport and other facilities on the North Queensland coast. The value of the fixed assets directly connected with raw sugar production in Queensland is estimated to be in excess of £30,000,000 while directly and indirectly no fewer than 200,000 people are dependant upon sugar production, processing and marketing for their livelihood.

By a system of pooling and a stabilised Australian consumption price the fluctuations in the world parity price of sugar, although they directly affect Queensland's export price, are spread over the whole crop so that the net return to the grower is an average price based on the total net returns for that season.

Until 1937 Queensland was able to dispose of the whole of her exportable surplus of sugar in the Empire markets, chiefly Great Britain but in that year in terms of the International Sugar Agreement, the Australian exports were fixed at a basic quota of 400,000 tons per annum for the five years from 1st September, 1937. This quota was subject to increases from year to year in proportion to any increases in consumption that took place in the Imperial preferential markets. The International Sugar Agreement was signed in London in May, 1937, by the representatives of twenty-one nations whose countries produced about 29,000,000 tons of sugar per annum out of a world total of about 30,000,000 tons.

Until the outbreak of the war this quota was the controlling factor in Queensland export trade and the agreement had effectively fulfilled its object of controlling and regulating the international movements of sugar.

With the advent of the war the operation of the International Agreement was suspended, and although the Agreement has been continued in pro-forma existence by annual protocols, it no longer operates as an effective regulator in international sugar marketing.

International transactions in sugar remain largely on the bulk purchase system developed during the war. The whole of the Australian exportable surplus has been purchased since 1940 by the British Ministry of Food who have also arranged to purchase all the sugar available for export from the 1946 and 1947 crops.

In 1919, following the acute shortage of sugar experienced through the British Empire as a whole during the 1914-18 war, the British Government accorded a preferential tariff of £3 15s. sterling per ton on Dominion sugar, and, except for one year, this rate of preference has operated ever since.

Preference is also accorded Australian sugar by the Canadian Government, the value of the preference in this market being £4 13s. 4d. sterling per ton.

In 1938-39 Great Britain absorbed 88 per cent. of Australia's sugar exports and Canada 11 per cent. The value of the preference accorded to Australian sugar in that year was £A1,830,152 and £A293,300 respectively.

It was on the basis of this preference that the export trade in sugar was built up and has been maintained. The whole of our exportable surplus, except for occasional negligible quantities, is sold within the British Empire.

The continuance of this export trade in sugar beyond the present period of world shortage is entirely dependant upon the retention of Empire preference since Queensland faces two tremendous handicaps as a world exporter of sugar, namely, she employs a white population enjoying a high standard of living while rival production depends almost entirely on coloured labour working on a much lower scale of subsistence, and she is farther away geographically than any other large producer from the largest and most lucrative markets.

Even with the present general shortage of sugar the current Cuban export quotation is about the same as the wholesale home consumption price in Australian capital cities—£33 4s. per ton.

FRUIT.

Except for small pre-war shipments of apples to the United Kingdom, grapes to eastern ports, and fresh pineapples to New Zealand, overseas export of fruit from Queensland has always been confined to the canned product. Excluding the Stanthorpe area, conditions suitable for fruitgrowing in this State occur mainly along the coast. For climatic reasons, therefore, the kinds of fruit which can be grown commercially in Queensland are chiefly those which flourish under tropical or sub-tropical conditions. In the main, fresh tropical fruits do not lend themselves to transport over long distances, nor except in the case of pineapples, are they suitable for canning. Among Australian States, Queensland enjoys a virtual monopoly with respect to the production of pineapples and, prior to the disruption of overseas trade by the war, canned pineapple constituted by far the largest part of the fruit exports from this State. This fact is shown in Tables 16-18 of Fruit Exports from Queensland to the United Kingdom for the period 1932-33 to 1939-40.

TABLE 16.

QUANTITIES OF FRUITS AND FRUIT PRODUCTS EXPORTED TO THE UNITED KINGDOM FROM 1932–33 TO 1939–40.

Year ended June 30th.	Apples.	Other Fresh Fruit.	Preserved Pineapples.	Other Preserves.	Dried Fruits.	Fruit Juices.	Fruit and Vegetable Pulp.
	Cental.	Cental.	Lbs.	Lbs.	Lbs.	Gals.	Lbs.
1932–33 ..	6,406	1	2,138,579	500	192	..	1,154
1933–34 ..	14,762	20	2,546,180	300	..	2,648	4,656
1934–35 ..	2,015	14	1,588,426	48	..	5	..
1935–36 ..	10,428	..	1,016,924	9,953	6,580	..	..
1936–37 ..	7,960	..	750,395	43,702	2,637	..	2,000
1937–38 ..	8,391	..	1,160,538	16,358	1,288	12,707	41,000
1938–39 ..	8,520	..	2,498,765	34,144	3,500	245	..
1939–40 ..	10,768	..	3,330,663	19,400	..	3,661	..

TABLE 17.

VALUE OF FRUITS AND FRUIT PRODUCTS EXPORTED TO THE UNITED KINGDOM FROM 1932–33 TO 1939–40.

Year ended June 30th.	Apples.	Other Fresh Fruit.	Preserved Pine-apples.	Other Preserves.	Dried Fruits.	Fruit Juices.	Fruit and Vegetable Pulp.	Total Value.
	£	£	£	£	£	£	£	£A.
1932–33 ..	5,397	5	39,058	16	6	..	71	44,553
1933–34 ..	12,420	14	44,484	9	..	1,364	123	58,414
1934–35 ..	1,495	15	28,234	1	..	2	..	29,747
1935–36 ..	8,462	..	19,814	234	242	..	..	28,752
1936–37 ..	6,583	..	15,657	923	169	..	55	23,387
1937–38 ..	8,070	..	24,424	337	85	1,124	588	34,628
1938–39 ..	7,653	..	51,664	808	178	44	..	60,347
1939–40 ..	11,563	..	74,794	370	..	832	..	87,559

Other than canned pineapple and pineapple juice, the only canned fruit exports of consequence have been relatively small shipments of canned tropical fruit salad to the New Zealand market. Tropical fruit salad, in which pineapple is the principal ingredient, is a relatively recent introduction for which a keen demand has already developed in Australia and which, until shipments were interrupted by the war, was also becoming popular in New Zealand.

Pre-war, the principal overseas markets for Queensland canned pinenapple were the United Kingdom and Canada. During the period 1934-39, that is, until overseas trade was disrupted by the war, an average of 53.4 per cent. of the yearly exports went to the United Kingdom, 38.2 per cent. to Canada, and 4.3 per cent. to New Zealand, the remaining 4.1 per cent. going to various destinations. Table 18 shows the exports during this time, in lbs. of fruit, and the value thereof in £'s (Australian).

The reason why the bulk of the pre-war export trade was carried out with the United Kingdom and Canada was that these were the only countries which accorded preferential tariffs to the Queensland product.

TABLE 18.

OVERSEAS EXPORTS OF CANNED PINEAPPLE.

Year.	United Kingdom.	Canada.	New Zealand.	Miscellaneous.	Total.	Value.
	Lb.	Lb.	Lb.	Lb.	Lb.	£A.
1932–33 ..	2,138,579	714,187	..	23,742	2,876,508	54,140
1933–34 ..	2,546,180	1,384,006	612	18,414	3,949,212	72,800
1934–35 ..	1,588,426	2,144,963	66,464	18,833	3,818,686	69,282
1935–36 ..	1,016,924	373,735	142,025	201,694	1,734,378	31,619
1936–37 ..	750,395	827,374	175,826	142,122	1,895,717	38,454
1937–38 ..	1,160,538	1,028,353	121,828	73,476	2,384,195	50,207
1938–39 ..	2,498,765	642,191	50,606	104,076	3,295,638	69,039
1939–40 ..	3,330,663	1,431,828	34,239	84,781	4,881,511	111,957

Tariff preference on canned pineapple from Empire sources entering the United Kingdom was at first confined to preferences on the sugar content. In March, 1932, however, a duty of 10 per cent. *ad valorem* was placed upon foreign imports, while Empire production (including that from Malaya) was exempt, except in respect of the sugar content on which a preferential rate was charged. Under the Ottawa Agreement, made late in 1932, the duty on foreign imports of canned pineapple into the United Kingdom was raised to 15 per cent., and was made exclusive of the duty on sugar content; this increased the net preference on Empire-grown pineapple to approximately 17 per cent. *ad valorem*. The 1932 tariff remained in operation until the first of January, 1939, when, under the terms of the Trade Agreement which Great Britain had made with the United States, the duty on canned pineapple from foreign sources was changed to 5s. per cwt. (1s. per doz. 30-oz. cans), exclusive of the duty on the sugar content. This amended preference represented a concession equivalent to approximately 6d. per cwt. in favour of the Hawaiian product, which dominated the pre-war market for high-grade canned pineapple in the United Kingdom.

From the time of the Australia-Canada Trade Agreement of 1931, until the Ottawa Agreement late in 1932, the import duty on Queensland sliced canned pineapple entering Canada was at the rate of 1 cent. per lb., while on the Malayan and Hawaiian products it was 3 and 4 cents per lb. respectively. Under the Ottawa Agreement, however, the Canadian duty on Malayan canned pineapple was reduced to the same level as that for Queensland, namely 1 cent. per lb. In 1936, the Canadian Government abolished the duty on Queensland canned pineapple entirely, while retaining that on Malayan and Hawaiian, thus giving the Queensland product a preference of 1 cent. per lb. over that from Malaya and 4 cents per lb. over that from Hawaii. These rates continued in operation until 1939, when the duty on Hawaiian canned pineapple was reduced by 1 cent. per lb.

That pre-war export trade in Queensland canned pineapple depended largely on the preferential treatment accorded the product in the United Kingdom and Canada is shown by the way the trade was affected by tariff adjustments in these countries. In the financial year 1931-32, for example, the Queensland product enjoyed a preference in Canada over similar lines from Hawaii and Malaya of 2s. 1½d. and 1s. 6d. respectively per dozen 30-oz. cans, and this market absorbed 88 per cent. of the exports (61,214 cases) compared with 12 per cent. (8,514

cases) marketed in the United Kingdom where preferences did not begin to operate until March, 1932. In the financial year 1932-33, however, during a large part of which the Ottawa Agreement was effective, the position was reversed and 74 per cent. of the exports (47,524 cases) were marketed in Great Britain and only 25 per cent. (15,871 cases) in Canada. (As noted in the preceding two paragraphs, the Ottawa Agreement gave increased preference to Queensland canned pineapple in the United Kingdom but abolished the preference which it had formerly enjoyed over the Malayan product on the Canadian market.) Though the ratio of Queensland exports which the United Kingdom and Canada absorbed became less disproportionate as further tariff adjustments were made in each of them, the former remained the principal market until wartime shipping difficulties diverted most of the trade to Canada.

Having regard to pre-war experience in the export of Queensland canned pineapple and the rise in costs of production which have taken place in the meantime, it is probable the resumption of overseas trade in this commodity will be dependent in large part on the continuance of preferential tariffs in the United Kingdom and Canadian markets. Provided adequate protection and encouragement is afforded in this direction however, there is every reason to believe that the industry could be expanded in Queensland to a degree where it could supply the whole of the Empire's requirements for high-grade canned pineapple, estimated at 500,000 cases annually, excluding Australian consumption. Such expansion would add to the security of the Commonwealth and of the Empire by encouraging closer settlement in the areas where it is most needed, viz., the northern coastal districts of Queensland. On the other hand, withdrawal of the existing preference would hinder and possibly entirely prevent expansion of the industry on economic lines, while it might also seriously endanger the financial stability of many of those already engaged in the cultivation of this crop.

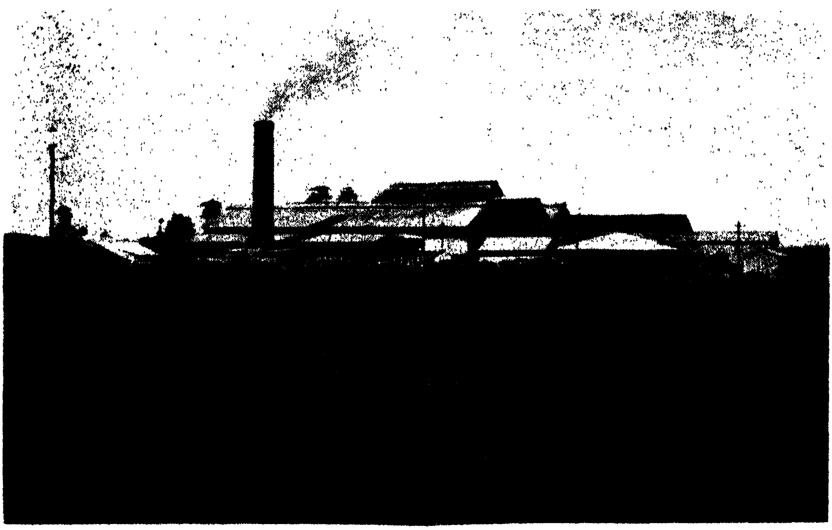


Plate 108.

TULLY SUGAR MILL, NORTH QUEENSLAND.

General Marketing Notes for May, 1947.

"Farmers now face three major problems. The first is the problem of adjusting their production away from the wartime pattern and over to peacetime requirements. The second is the problem of maintaining market outlets on a permanent basis that will make full use of their ever-increasing productive capacity. And, finally, there is the need for maintaining and restoring soil fertility for the long pull ahead."—Clinton P. Anderson, Secretary of Agriculture, United States Department of Agriculture.

The British Parliament passed its first *Agricultural Marketing Act* in 1931, and marketing boards were set up for a number of commodities. A variant of the type of organised marketing originated in Queensland was adopted, particularly the principle of compulsory co-operation. It is interesting to note that the United Kingdom Government has now appointed a committee to review the working of the agricultural marketing laws and to consider what modifications of the provisions of those measures for the organization of producers are desirable in the light of experience before 1939 and of developments during the war and subsequently in government policy as it effects food and agriculture.

Production Trends.

Dairy production is declining as herds are completing their lactation period, but quality is improving as a result of the cool weather. Large acreages of winter fodder crops are available, and grazing-off has now commenced.

With the exception of the Innisfail area, rainfall in the sugar districts during May was generally light and crops made only slow progress. The 1947 crop is not expected to be much better than the 1946 crushing.

Late maize crops are showing promise of good yields, and it is expected that total production for all districts will approximate 2,500,000 bushels. The Atherton Tableland crop is not now expected to reach the 19,000 tons previously estimated.

Apart from early plantings, very satisfactory yields have been obtained from grain sorghum on the Darling Downs, and it now appears that the total yield for Queensland will be at least 3,000,000 bushels.

Early crops of wheat have germinated well. Large areas are now being sown under ideal conditions.

A record peanut crop of 20,000 tons is expected from an approximate area of 42,000 acres. Unsuitable weather has delayed threshing.

Egg supplies improved during May. This may indicate recovery from the effects of poor feeding during the pullets' growing period. The grain position is now better, although bran, pollard and meatmeal are still in short supply.

QUEENSLAND SHOW DATES FOR 1947.

July.

Charters Towers	1st, 2nd, and 3rd
Barcaldine	2nd and 3rd
Bowen	2nd and 3rd
Kilcoy	3rd and 4th
Ayr	4th and 5th
Townsville	8th, 9th, and 10th
Rosewood	11th and 12th
Cleveland	18th and 19th
Ingham	18th and 19th
Nambour	10th, 11th, and 12th
Gatton	18th and 19th
Cairns	22nd, 23rd, and 24th
Tully	25th and 26th
Atherton	29th and 30th
Crow's Nest	30th and 31st
Laidley	25th and 26th

Innisfail 31st, and 1st and 2nd Aug.

August.

Goombungee	2nd
Lawnton	1st and 2nd
R.N.A., Brisbane	9th to 16th

September.

Kandanga	5th and 6th
Malanda	5th and 6th
Canungra	6th
Rocklea	13th
Beenleigh	19th and 20th
Pomona	19th and 20th
Southport	27th

October.

Nerang	3rd

GENERAL NOTES

Staff Changes and Appointments.

Following the appointment of Mr. A. F. Bell, M.Sc. (Calif.), D.I.C. (Lond.), A.A.C.I., as Assistant Under Secretary (Technical) in the Department of Agriculture and Stock, and the allocation to him of responsibilities associated with that position, it was found necessary to relieve him of certain of the duties associated with the position of Director of Sugar Experiment Stations. Mr. E. R. Behne, B.Sc., M.Sc. (Applied), A.A.C.I., was appointed as Assistant Director of Sugar Experiment Stations and Chief Mill Technologist, and has carried out these duties since May, 1945.

An Executive Council Minute has been issued relieving Mr. Bell of the appointment of Director of Sugar Experiment Stations, and appointing Mr. Behne as Director.

Mr. P. A. Gordon, Inspector, Division II., Division of Animal Industry, has been transferred from Brisbane to Helidon, and Mr. H. W. O'Dea, Inspector, Division II., on probation, has been transferred from Brisbane to Atherton.

Mr. William Webster, B.V.Sc., H.D.A., at present Divisional Veterinary Officer in the New South Wales Department of Agriculture, has been appointed Director on probation in the Division of Animal Industry.

Mr. J. C. J. Maunder, B.V.Sc., Divisional Veterinary Officer, who has been Acting as Chief Inspector of Stock, has been appointed Chief Inspector of Stock and Chief Inspector of Slaughterhouses in the Division of Animal Industry.

Mr. T. W. Lowry, Inspector, Horticulture Branch, has been appointed Senior Inspector, Horticulture Branch, as from 1st July, 1947.

The following appointments have been made in the Dairying Division, Department of Agriculture and Stock:—

- Mr. S. E. Pegg, Q.D.D., Senior Adviser in Dairying, Brisbane, has been appointed Senior Adviser (Herd Testing);
- Mr. F. C. Coleman, Q.D.D., Senior Adviser in Dairying, Gladstone, appointed Senior Adviser in Dairying, Brisbane;
- Mr. G. R. Sigley, Q.D.D., Adviser in Dairying, Oakey, appointed Senior Adviser in Dairying, Toowoomba. Mr. Sigley will succeed Mr. E. C. Olive, Senior Adviser, Toowoomba, who retires from the Public Service on 31st March;
- Mr. W. J. Park, Q.D.D., Adviser in Dairying, Pittsworth, appointed Senior Adviser in Dairying, Dalby;
- Mr. W. A. G. Haylett, Q.D.D., Q.D.S., Dairy Officer, Biloela, appointed Adviser in Dairying, Oakey; and
- Mr. P. McCallum, Dairy Officer, Toowoomba, who has been appointed Adviser in Dairying, Pittsworth.

Mr. G. C. Simmons, B.Sc., Assistant to Bacteriologist, Animal Health Station, Yeerongpilly, has been appointed Assistant Bacteriologist at the Station.

Mr. J. E. Ladewig, Q.D.A., B.Sc.Agr., has been appointed Soil Conservationist within the Department of Agriculture and Stock.

In furtherance of the policy of expansion in the Sheep and Wool Branch of the Department of Agriculture and Stock, the following appointments in that branch have been announced:—

- Mr. H. Pope, Adviser, has been appointed Senior Adviser in the Sheep and Wool Branch, Department of Agriculture and Stock, St. George.
- Messrs. D. J. McK. McKerrow (Barnsdale, Oorindi, N.Q.) and M. N. S. Jackson (Wynnum West) have been appointed Senior Advisers in the Sheep and Wool Branch, and will be stationed at Charleville and Winton, respectively.

Mr. E. C. R. Sadler, A.A.U.Q., has been appointed Accountant in the Department of Agriculture and Stock.

Mr. F. Treacy, A.F.I.A., has been appointed Inspector of Accounts under *The Dairy Produce Acts* in the Dairying Division, and Mr. A. J. Everist, Senior Clerk in the Marketing Division and Registrar of Primary Producers' Co-operative Associations.

Certain consequential appointments have also been made in the Marketing and Accounts Branches of the Department.

Mr. N. E. H. Caldwell, M.Agr.Sc., Horticulturist, Division I, in the Horticultural Branch of this Department, has been transferred from Toowoomba to Brisbane.

Sugar-cane Levy.

Under *The Regulation of Sugar Cane Prices Acts*, 1915 *to* 1941, a levy is declared annually in order to meet the costs of administration of these Acts, and this levy is borne in equal proportions by the canegrower and the millowner. The levy for the 1947-48 season has been fixed at 2d. on every ton of sugar-cane received at a sugar works.

Export Egg Wastage.

In recent years exports of Australian eggs to Great Britain waste caused by bacterial rotting has occurred. One of the main causes contributing to this wastage is the washing of eggs before export. In an endeavour to reduce this loss in the coming season the Federal Department of Commerce and Agriculture proposes that eggs only slightly soiled will be passed for export. Producers, therefore, are urged to restrict the washing to heavily soiled eggs. These, together with the eggs too small in size for export, are to be separately cased and marked "Local." The clean eggs and the slightly marked eggs which have not been washed shall be clearly marked on the cases with the word "Unwashed." These will be graded and repacked at the packing floors for selection for export.

Council of Agriculture.

Because of the constitution of new commodity boards, Orders in Council have been issued under *The Primary Producers' Organisation and Marketing Acts* to provide additional representation on the Council of Agriculture. The Navy Bean Marketing Board and the Queensland Dairymen's State Council will each be entitled to elect a representative to the Council. For the purpose of electing a representative to the Council, the Central Queensland Egg Marketing Board has been grouped with the Egg Marketing Board which has been operating in Southern Queensland for a number of years.

Wild Life Preservation.

An Order in Council has been issued under *The Fauna Protection Acts of* 1937, declaring Binna Burra, near Beechmont, to be a sanctuary for the protection of native birds and animals; also the camping and water reserves, parish of Abingdon, in the Mirani district, to be a sanctuary for the protection of fauna.

Sugar Experiment Stations.

The Governor in Council has approved the reconstitution of The Sugar Experiment Stations Advisory Board for a further period of three years from 1st April, 1947, to 31st March, 1950.

The Hon. H. H. Collins, M.L.A., Minister for Agriculture and Stock, as Chairman, and Mr. A. F. Bell, Director of Sugar Experiment Stations, are the Government Representatives on the Board. Messrs. W. L. Poustie (Silkwood, Innisfail) and L. G. Scotney (Oakwood, Bundaberg) are the representatives of the canegrowers, and Messrs. J. W. Inverarity (Kalamia Estate, Ayr) and J. C. Collier (Amalgamated Sugar Mills Ltd., Pleystowe, Mackay) the representatives of the manufacturers of cane sugar.

Slaughter of Horses.

Regulations under *The Slaughtering Act of* 1898 have been amended to provide for the licensing of slaughterhouses for the slaughter of horses only, and to prohibit the slaughter at such slaughterhouses of any stock the flesh of which is intended to be used for the food of man. Provision is also made for the treatment of all horse flesh, to facilitate identification by the public, by spraying or dipping on all surfaces with methyl violet. Furthermore, it is provided that any premises in which horses are slaughtered or in which horse flesh is stored, sold, or otherwise disposed of shall not be used for any other purpose, and that there be displayed in such premises a sign indicating that the horse flesh is available for sale for dogs and cats only, and not for human consumption.

Rural Topics

Colic in Horses—Some Common Causes.

Perhaps the commonest cause of colic in horses is giving the animals food to which they are not accustomed. A sound physiological reason exists for not doing this. It has been proved that the character of the food influences the quantity and quality of the gastric and pancreatic juices. A definite and constant diet produces juices capable of digesting it, but utterly incapable of dealing with sudden changes of food. Under proper conditions, no food will cause colic, although some (as, for example, wheat and barley) are more indigestible than others; but many foods will do so if given in excess, or at the wrong time, such as giving lucerne to a horse that has been starved for a time.

Horses can exist on practically any food that is digestible, provided they are gradually accustomed to it; but to give a horse a full feed of, say, maize, if he has never had the grain before, is to invite digestive troubles that may cause death. Again, grass-fed horses suddenly put on to dry feed on being taken on a long journey get colic, owing to the sudden change of food.

To avoid colic, give food at regular intervals, and see that the food is of good quality and of proved dietetic value. Mouldy corn, damaged oats, or musty hay very often produce colic, while proprietary foods of unknown composition, and frequently of doubtful feeding value also, often do a great deal of harm. Do not give green forage in an immature, fermented, or over-ripe condition.

Bran mixed with maize is a favourite food, but it is much too laxative for a horse in work, and is a frequent cause of an attack of colic. Do not give large quantities of bran to a working horse. Bran is a good food to maintain the contents of the bowels in a soft condition, and to keep them acting, especially during periods of rest.

Do not suddenly alter the amount of food given. It is a common practice to have horses fed up for a day or two prior to severe work, and this causes much intestinal trouble, such as stomach staggers.

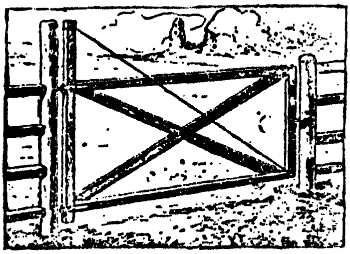
Never forget that young horses cannot digest as much corn as old ones. Horses when rested, even for a day or two, should have their food, especially corn, reduced. Neglect to do this is the cause of much colic.

Another common cause of repeated slight attacks of colic, especially with working horses on farms, is the dry, rough, coarse, and indigestible nature of the herbage found in many paddocks. A certain amount of bulky fodder increases the digestibility of the more concentrated foods, such as oats, but too great a quantity of such food greatly weakens the power to digest. A good example of the results of this is seen in so-called ''wild melon poisoning.'' The horse's stomach is not adapted for the digestion of coarse food, and any coarse food that it eats is digested in the large intestines. Farm horses, as a rule, eat far too much rough bulky fodder, and many suffer in consequence. A working farm horse does not require more than 12 lb. of hay a day, and the rest of the ration should be made up of grain, such as oats, or half oats and maize.

Red Poll's Yield—New World Record.

A world's record yield for a Red Poll cow has been put up by a member of the Victorian Department of Agriculture herd at the State Research Farm, Werribee. Under official test, this cow, ''Victoria Electricity,'' has produced in 273 days a total of 16,103 lb. of milk with a test of 4.82 per cent. butter-fat, equivalent to 777 lb. of butter-fat. Officers of the Department of Agriculture believe this to be a world's record for the Red Poll breed for a 273 days' test.

This striking performance recalls the fact that ''Muria,'' one of the foundation cows of the herd at Werribee, in 1915 broke the world's record for the breed for both 273 and 365 days, producing 706 lb. of butter-fat in the 273 days' test and 884 lb. in the full 365 days.

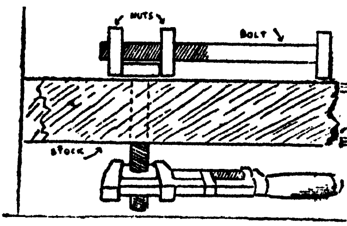


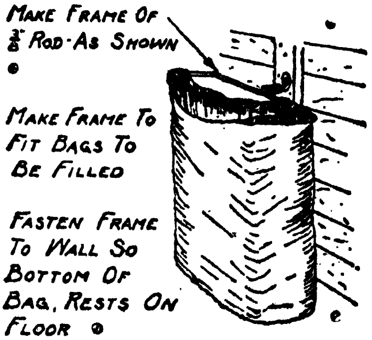
A NON-SAGGING GATE.

A farm gate may be readily prevented from sagging by extending upward the side member to which the hinges are attached, and running one or two strands of fencing wire from the top of this member to the opposite lower corner. The wire may, of course, be attached to the upper corner, but the fastening, as shown, places the least strain on the wire brace.

IMPROVISED WRENCH.

When it is found that a bolt to be removed is turning and there is only one wrench, look in the machine box for a bolt, fit it with two suitable nuts, and use it for a substitute wrench. It works perfectly. The nuts can be adjusted to the size of the nut to be removed by screwing them apart or together.



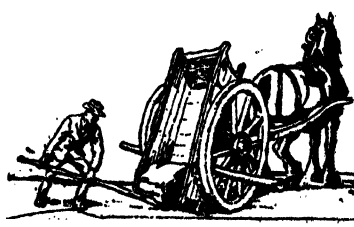


SIMPLE SACK HOLDER.

This shows how to make a handy sack holder out of $\frac{3}{8}$-inch iron rod. Any farmer can make it in a few minutes and will find it very convenient to fill a few sacks of grain without help. If there is any trouble with the sack not staying on the rod, two or three snap clothespins or battery clips will remedy it.

ONE-MAN LOADING.

Leave tailboard in, tip cart right back, roll object on to tailboard and tie it there if necessary. Put strong pole right through spokes at rear of both wheels and then start horse forward. The pole lifts the tail of the cart with object inside. Replace tip pin, remove pole and drive on.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

"DOES YOUR CHILD WALK WELL?"

A MOTHER may with advantage look at her child with a critical eye as he trots off to school or kindergarten with his little friends. Pretend that he is Johnny Jones from down the street instead of her own precious little son and see whether she can find anything to criticise in the way he stands or walks or in his general appearance. If she can, then she has ample opportunity to have it corrected while correction is relatively easy.

In the correct standing and walking position, the head is held up, the chest raised and the lower abdomen flattened, the back is almost straight. The knees are straight and without strain and the feet are pointed straight forward. There are several causes of wrong position or posture, but one in particular is faulty shoes. It is almost impossible to wear a faulty shoe without falling into wrong posture in standing and walking. Bad shoes do two things: they twist or misplace the bones of the feet; and they cause pains in both feet, legs, and body, the effect of wrong posture.

Shoes and Stockings.

From early infancy a baby's footwear should be fitted carefully. The beginning of foot deformity may be caused by badly fitting bootees. These should always be roomy and knitted with a square, not a pointed, toe. If they shrink in washing, they should be discarded. Socks and stockings should conform to the shape of the foot and should be one inch longer when new to allow for shrinkage. After washing they should be at least half an inch longer than the foot.

Shoes should be half to three-quarters of an inch longer than the foot when the child is standing in them and a quarter of an inch wider. Before buying shoes for a child it is a good plan to make a tracing of the foot on a piece of paper with the child standing, and then trying the shoe over it so that the right amount of room is provided.

The inner line of the shoe should be straight, not bearing round to a point, and the toe broad enough for the child's toes to move easily. The heels should be low and broad. The leather of the upper part of the shoe should be soft and pliable. The young child often does better in laced boots.

Patent leather shoes are not good as they make the feet perspire; and rubber shoes may not be worn except for sports. Sandals well cut and well fitted are permissible.

Shoes which are too tight or not long enough will cause bunions or corns and callouses. The narrow shoes with a pointed toe causes the feet to turn out and throws a strain on the inner edge of the foot. This tends to break down the arches and cause the condition known as flat foot.

If a child's feet turn outward and his ankles bend inward, a doctor who specialises in this kind of work should be consulted either at the hospital or in private practice. He will probably advise special exercises to strengthen the muscles of the feet and legs and will also advise whether the shoes need adjustment.

It is important to keep shoes in good repair, otherwise they do not give proper support. Shoes which have lost their shape or have become too small should be discarded. In a child's early years shoes are usually outgrown before they are worn out, and it is false economy and cruel to the child to make him continue to wear them.

Any further information on this or any other matter concerning maternal and child welfare may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

BOOKS FOR THE BUSH.

The Bush Book Club is one of those friendly organizations with a practical purpose, it has no axe to grind, no urge to uplift. It exists for the purpose of providing a circulating library for country people living in the remoter places where there are no local public libraries. The only qualification need for membership is described thus: "Dwellers in bush districts who are not within reach of a school of arts or other local library." To join, all that is necessary is to write to the Hon. Secretary, tell her you are not within reach of a school of arts library, mention your nearest railway station, and the sort of books you would like. Each reader pays 2s. 6d. a year and the cost of getting the books from the railway station. The parcel contains ten books, a number of magazines and illustrated papers, and is carried free on the railways. At the end of three months or thereabouts, if you are ready for more, just send word to the Hon. Secretary, and she will arrange for you to exchange with another reader. Do not send the books back to Brisbane or Townsville (there is a branch in that city). This exchange or "pass-on" is then entered in a card index so that parcels do not double back on their journeys.

In each book is pasted a label asking for the co-operation of readers in reporting the condition of the parcels. With travelling long distances by railway, service car, cream truck, or pack bags, there is necessarily a lot of wear and tear so, if a parcel is shabby, let the Hon. Secretary know; for instance, "Five of the books are beyond reading." Right! Then a supplementary parcel with five books and a new set of magazines and newspapers to bring the parcel up to standard size and quality is packed and sent. To keep up this standard of service the Club must have the co-operation of readers.

How is all this done? A committee member is in charge of bands of book-lovers who work for a certain time each day. The work is all voluntary so it has to be fitted in with home chores. Friends and well-wishers send books to the Club regularly, and once a year the committee invites Mr. and Mrs. Brisbane "to come and see the Bush Book Club and to bring a book or two to fill its shelves." The billy boils all day, and all comers are entertained with tea and biscuits. Every year new friends are made for the Club, and thousands of books are obtained. The committee collects the necessary finance (rent, postage, and other expenses, have to be paid) or earns it by entertainments.

It is,, perhaps, a small way to pay the city's debt to the country, but the members of the committee are all book-lovers, and so they "say it with books." If there is anything else you would like to know write to the *Hon. Secretary, Queensland Bush Book Club, Victory Chambers,* 249 *Adelaide Street, Brisbane.*

QUEENSLAND WEATHER IN MAY.

During the first three weeks of May the dry spell of April continued over most of the State. Persistent south-east winds accounted for an abnormal number of rain days on the South Coast fringe and far north Tropical Coast, but daily registrations were mostly light. The Darling Downs East commenced to receive scattered benefits after the middle of the month, but the most useful rain distribution occurred between the 24th and 27th, when approximately 1 to 1½ inch totals were registered over the greater part of the south-east quarter of the State with resultant over-average aggregate totals in sections of the Warrego, Maranoa, Downs, Central Coast, and Central Highlands. Parts of the far North Coast were also above average. The rains over agricultural areas of the south-east quarter were particularly opportune, especially in wheatgrowing areas, where sowing commenced on a record 500,000 acres. Normal or light but well spaced rain during winter and spring should bring good harvest results. Over the greater part of southern inland and coastal Queensland improved to good seasonal prospects in all farming pursuits have followed the summer recovery rains and the recent freshening falls. Early seasonal rains had been sufficient for reasonable winter and spring carrying capacity over much of pastoral inland Queensland, but during February and March sections of the Central and Lower West through the Central Interior to parts of the Central Lowlands and Highlands received relatively low or poor totals, and with no rain during April and May local adverse prospects are being maintained.

Pressure.—During the first half of the month the southern low pressure activity belt was located well to the south of the Continent and an almost unbroken series of high pressure centres moved slowly across the southern half of the Continent. The high pressure ridge stretching from eastern Queensland to New Zealand was particularly persistent, maintaining moderate to fresh south-east coastal weather during the first three weeks, and adjacent South Coast and far North Coast districts recorded mostly light showers on more than a normal number of days. By the third week a fairly definite east to north-east upper circulation was developing over Queensland, and on the 22nd a more vigorous southern "low" and colder southerly front moved through the south-west of Western Australia. Trough formation ultimately developed on the 24th and 25th from western Queensland south to the low centre over Victoria and Tasmania, and as the cold front moved into the south-west of Queensland rains developed and spread eastward during the period 25th to 27th. With the advent of another fine weather "high" fine frosty weather prevailed for the last three days with a recurrence of fresh south-east winds on the coast.

Temperatures.—Maximum temperatures were mostly 1 to 2 deg. above normal (2.7 deg. at Thargomindah and 2.8 deg. at Longreach). Mild night temperatures were general up to 3.9 deg. above average at Georgetown and 3.4 at Boulia.

Frosts.—Light and local on Downs highlands, 4th to 7th. Fairly general south-east quarter, 28th to 31st. Bybera screen and grass minimum temperatures 31 deg. to 21 deg., Stanthorpe 26 deg. to 24 deg., and Mitchell 32 deg. to 26 deg. on 31st.

Brisbane.—$\frac{9 + 3}{2}$ 30.183 inches (normal 30.084 inches). Highest mean May pressure since 30.191 in 1901. *Temperature.*—Mean maximum 73.5 deg. (normal 73.6 deg.); mean minimum 57.7 deg. (normal 55.5 deg.); mean temperature 65.6 deg. (normal 64.6 deg.). Highest daily reading 80.4 deg. (8th). Lowest 46.2 deg. (29th). *Rainfall.*—218 points on 17 days (average 274 on 10 days). Highest number of rain days since 1919 included 10 days less than 10 points. *Sunshine.*—215.4 hours (normal 207.9). *Fog.*—Thick night of 26th and early morning of 27th. *Suburbs.*—Scattered mist or fog patches 18 nights.

The rainfall position is summarised below—

Divisions.	Normal Mean.	Mean May, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	137	49	64 below
Peninsula South	50	1	98 ,,
Lower Carpentaria	38	1	97 ,,
Upper Carpentaria	58	21	64 ,,
North Coast Barron	300	368	23 above
North Coast Herbert	434	586	35 ,,
Central Coast East	165	121	27 below
Central Coast West	81	71	12 ,,
Central Highlands	127	79	37 ,,
Central Lowlands	87	26	70 ,,
Upper Western	51	1	98 ,,
Lower Western	69	22	68 ,,
South Coast, Port Curtis	203	149	27 ,,
South Coast, Moreton	349	282	19 ,,
Darling Downs, East	156	156	Nil
Darling Downs, West	143	141	1 ,,
Maranoa	137	132	4 ,,
Warrego	112	114	2 above
Far South-West	97	49	49 below

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

JULY.

Supplied by W. J. Newell, Hon. Secretary the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.39	5.03	Cairns	10	48	Longreach	27	43
6	6.39	5.05	Charleville ..	25	29	Quilpie	37	33
11	6.39	5.07	Cloncurry	37	62	Rockhampton ..	2	18
16	6.38	5.10	Cunnamulla ..	31	27	Roma	15	19
21	6.36	5.12	Dirranbandi ..	22	16	Townsville ..	9	40
26	6.34	5.15	Emerald	12	27	Winton	30	51
31	6.31	5.17	Hughenden ..	22	48	Warwick	5	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	p.m.	a.m.
1	3.14	4.34
2	3.58	5.29
3	4.46	6.22
4	5.38	7.13
5	6.32	7.59
6	7.27	8.41
7	8.22	9.19
8	9.17	9.53
9	10.12	10.24
10	11.06	10.55
11	..	11.26
	a.m.	
12	12.03	11.58
		p.m.
13	1.02	12.33
14	2.05	1.13
15	3.12	1.59
16	4.21	2.54
17	5.30	3.58
18	6.36	5.08
19	7.34	6.20
20	8.24	7.30
21	9.07	8.37
22	9.45	9.40
23	10.19	10.41
24	10.52	11.39
25	11.24	..
		a.m.
26	11.57	12.36
	p.m.	
27	12.33	1.32
28	1.12	2.29
29	1.55	3.24
30	2.42	4.18
31	3.33	5.09

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	29	12	44	26	19	1	52	29
6	27	12	43	26	18	1	51	29
11	19	19	35	36	10	10	41	41
16	11	29	26	44	0	20	28	52
21	14	23	29	39	4	14	33	45
26	25	14	41	30	16	5	47	34
31	30	10	45	24	20	0	53	27

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	52	8	66	36	50	21	43	8
3	54	4	67	33	51	19	44	5
5	52	5	66	34	50	20	43	6
7	44	11	61	38	45	23	37	11
9	35	20	54	44	39	29	29	18
11	30	31	51	51	35	36	25	26
13	20	40	43	58	28	43	17	34
15	10	50	37	63	22	49	9	42
17	5	53	35	66	19	51	5	44
19	8	51	36	64	21	50	8	43
21	17	38	41	57	26	42	15	33
23	27	27	49	48	33	33	23	23
25	38	17	56	42	41	27	32	16
27	47	12	63	28	47	24	39	12
29	53	6	67	34	50	20	44	7
31	54	4	67	33	51	19	44	5

Phases of the Moon.—Full Moon July 3rd, 8.38 p.m.; Last Quarter, July 11th, 8.54 p.m.; New Moon, July 18th, 2.15 p.m.; First Quarter, July 25th, 8.54 a.m.

At the end of July the sun will rise and set about 22 degrees north of true east and true west respectively. On the 5th the Earth will reach the point in its orbit known as aphelion and will then be at its maximum distance from the Sun—94,600,000 miles.

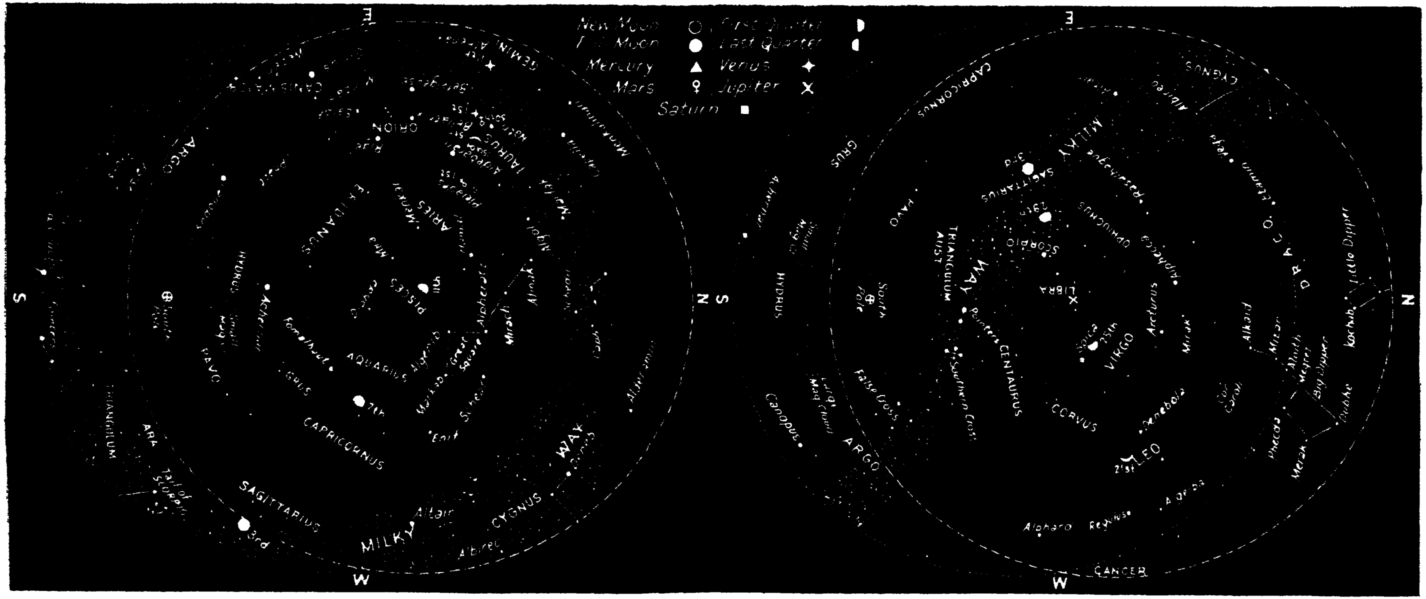
On July 11th and 23rd the moon will rise and set at true east and true west respectively.

Mercury.—All this month will be in the neighbourhood of Castor and Pollux and at the beginning of the month will set about 1½ hours after the sun. Its angle east of the sun gradually diminishes until on the 14th it will be in inferior conjunction. After this date it will move to the west of the sun and will rise over 1 hour before sunrise by the end of July.

Venus.—At the beginning of the month, near Nath, in the constellation of Taurus, will rise about 1 hour 15 minutes before the sun. On the 22nd it will pass 5 degrees to the north of Mercury and at the end of the month, almost in line with Castor and Pollux, will rise only ½ hour before the sun.

Mars.—In the constellation of Taurus will rise between 3.45 a.m. and 4.45 a.m. on the 1st of July and will pass 5 degrees to the north of Aldebaran on the 15th. On the 31st, near Nath, it will rise between 3.30 a.m. and 4.30 a.m.

Jupiter.—In the constellation of Libra, will rise near mid-day at the beginning of July and set between 2.45 a.m. and 4 a.m. At the end of the month it will set about midnight.



Saturn.—At the beginning of the month will set only 2 hours after the sun, and by the end of the month will be too close in line with the sun for observation. Towards the end of October it may be seen low in the east during morning twilight in the constellation of Leo.

Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th July. (For every degree of longitude we go west time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York, and the dotted circle is the horizon for places along the New South Wales border. When facing north hold N at the bottom; when facing south hold S at the bottom; and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about 1 hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MAY RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1946.	May, 1947.
	In.		In.	In.
North Coast.				
Atherton	2·34	42	2·04	3·32
Cairns	4 51	61	4·28	4·29
Cardwell	3 64	71	2·11	4·34
Cooktown	2·76	67	1·80	5·87
Herberton	1·72	57	1·09	0·89
Ingham	3·76	51	2·97	7·52
Innisfail	12·39	62	6·62	16·12
Mossman	3·10	19	3·32	4·84
Townsville	1·24	72	0·21	1·04
Central Coast.				
Ayr	1·09	56	0·12	1·02
Bowen	1·28	72	0·99	0.62
Charters Towers	0·78	61	0·05	0·81
Mackay	3·86	72	2·92	1·81
Proserpine	4·22	40	1·61	1·91
St. Lawrence	1·74	72	0·04	1·93
South Coast.				
Biggenden	1·80	44	0·35	0·61
Bundaberg	2·63	60	0·54	1·75
Brisbane Bureau	2·74	95	0·27	2·18
Caboolture	3 27	67	0·20	2·43
Childers	2·17	48	0·60	1·30
Crohamhurst	5·04	50	1·19	4·43
Esk	2·00	56	0·12	1·81
South Coast—contd.				
Gatton College	1·53	44	0·21	..
Gayndah	1·55	72	0·06	0·26
Gympie	2·91	73	0·46	1·64
Kilkivan	1·85	62	0·44	1·49
Maryborough	3·01	72	1·02	1·94
Nambour	5·09	47	1·11	3·72
Nanango	1·55	61	0·27	2·69
Rockhampton	1·60	72	0·22	1·34
Woodford	3·03	55	0·46	2·88
Darling Downs.				
Dalby	1·29	73	0·01	1·32
Emu Vale	1·12	47	0·40	1·42
Jimbour	1 21	64	..	0·90
Miles	1·51	58	0·13	1·64
Stanthorpe	1 75	70	0·97	0·99
Toowoomba	2·14	71	0·25	2·43
Warwick	1·48	78	0·41	1·80
Maranoa.				
Roma	1·42	69	0·05	1·38
St. George	1·41	62	0·02	1·25
Central Highlands.				
Clermont	1·29	72	0·08	0·62
Springsure	1·23	74	..	1·35

CLIMATOLOGICAL DATA FOR MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Coastal.									
Cairns	..	77	68	85	1, 9, 10, 25	63	22	429	16
Herberton	..	62	57	79	7	46	22	89	12
Townsville	..	82	68	86	5, 6	61	20, 21	104	8
Rockhampton	30·14	78	60	84	8	46	31	134	10
Brisbane	30·22	74	58	80	8	46	29	218	17
Darling Downs.									
Dalby	..	74	48	80	8, 9, 10	33	31	132	3
Stanthorpe	..	66	45	76	8	26	31	99	10
Toowoomba	..	67	49	76	7, 10	33	31	243	11
Mid-Interior.									
Georgetown	29·98	87	63	90	26	53	10, 12	..	..
Longreach	30·16	83	55	91	10	46	31	..	..
Mitchell	30·21	74	45	84	8, 9	32	31	102	1
Western.									
Burketown	..	88	65	92	1	57	23	..	..
Boulia	30·11	82	57	90	1	43	31	..	..
Thargomindah	30·18	76	52	83	6, 7	41	30	44	2

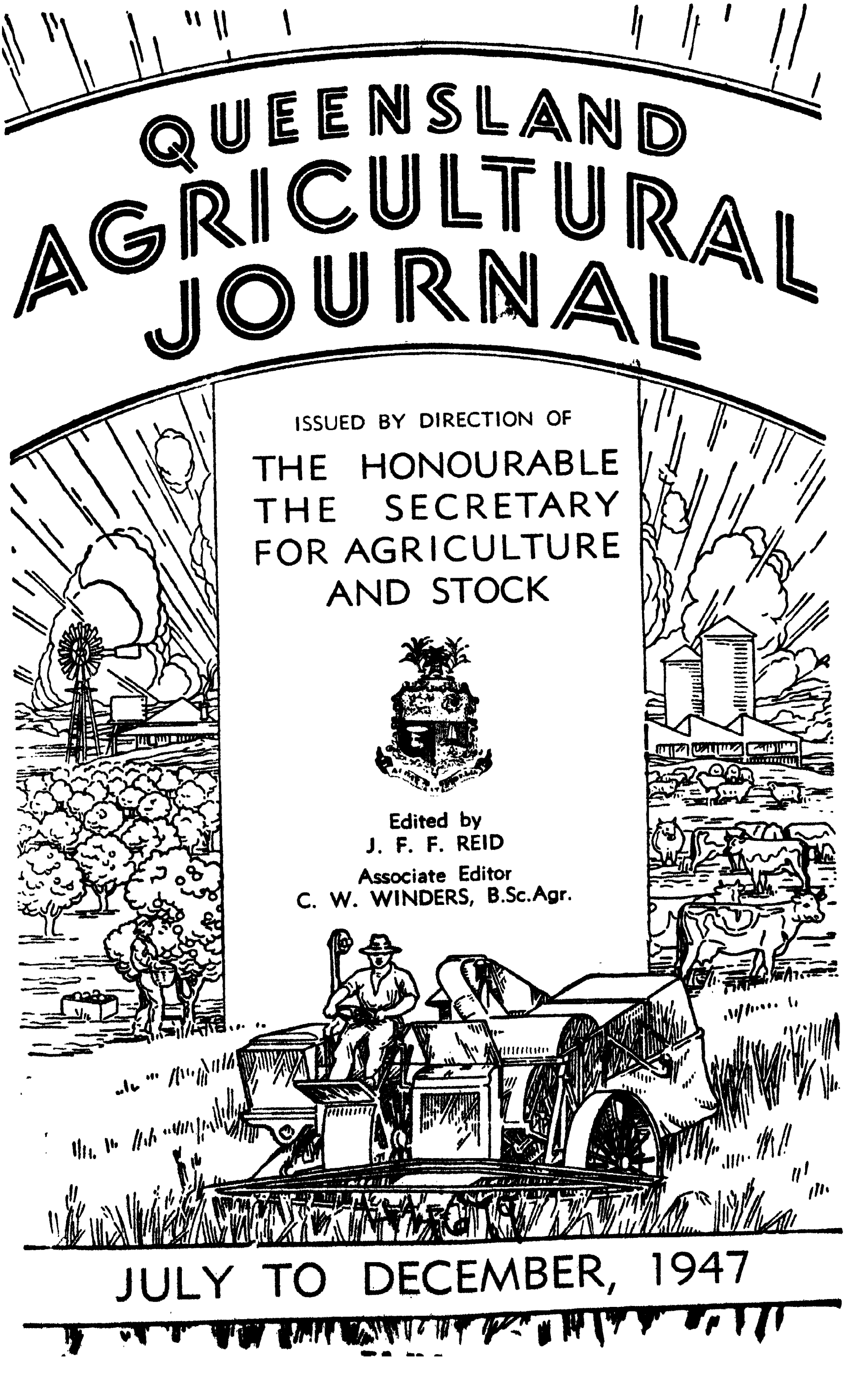
A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Supplement to the "Queensland Agricultural Journal," September, 1948.

Volume 65

QUEENSLAND AGRICULTURAL JOURNAL



ISSUED BY DIRECTION OF

THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK

Edited by
J. F. F. REID

Associate Editor
C. W. WINDERS, B.Sc.Agr.

JULY TO DECEMBER, 1947

Volume 65 Part 1

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GOVERNMENT PRINTER, BRISBANE

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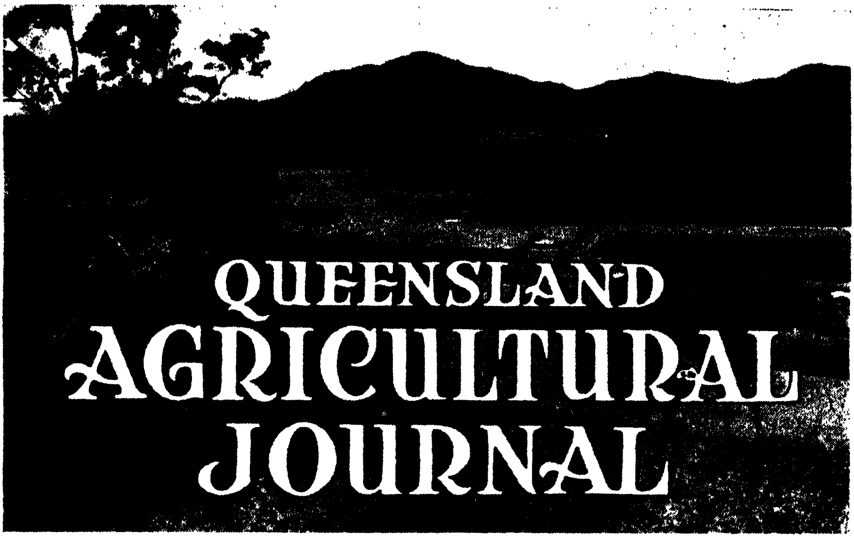
ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



Volume 65 | 1 JULY, 1947 | Part 1

Event and Comment.

Fifty Years Ago.

IN July, 1897, the first issue of *The Queensland Agricultural Journal* was published. Its publication continued without a break until December, 1941, when, because of the war situation at that time, it was temporarily suspended. Publication was resumed in July, 1943. The *Journal* has, therefore, served the land industries of Queensland for nearly half a century.

History is seldom recorded at the time it is made. Institutions and movements are usually built up slowly from small beginnings and with uncertain objectives. With a magazine, however, its history is recorded in its own bound volumes. From the volumes of the *Journal*, numbering nearly one hundred, it is possible to see in correct perspective the extent of its services and evaluate its influence on the development of agriculture and stock-raising in this State.

In its initial number, the purpose of the *Journal* was adequately expressed. It was to be essentially utilitarian in character, a vehicle of current technical and practical information on farming problems and practice. The aim of the Department was to issue a publication of all-round value to the agricultural and pastoral industries and, reviewing its monthly issues over the past fifty years, that aim, it is believed, has been attained. It has won recognition in the field of agricultural journalism as an authority on primary production in Queensland through the high standards set by its contributors since its establishment. And through the years as agriculture was developing into a complex industry, showing at each step the direct influence of

science, the *Journal* has been a channel for the dissemination of knowledge newly gained by investigation, invention and improvement in farming practice in an easily readable and assimilable form.

In the first editorial announcement it was stated that the object of the Department had always been to give every practicable aid to those engaged in rural pursuits, as set out in the following excerpt from the prefatory announcement in the first issue of the *Journal*:—

> In times past with the limited resources at the command of those entrusted with the working of the Department, much has been accomplished in the way of importing new varieties of fruits, cereals, seeds, plants and implements, and by the publication of useful pamphlets bearing on matters of interest to farmers and fruitgrowers. These were widely distributed and effected their purpose fairly well. But is remained for the Government to recognize the great importance of the industry, and set practically to work to raise it to a high standard of efficiency. Experts have been engaged to carry their technical and practical knowledge to the very doors of the settlers. Thus all agricultural interests are being promoted and fostered by practical instruction from men of high attainments in their several vocations, and by the establishment of an Agricultural College and Experimental Farms from which it will, it is hoped, be found that much interesting and practical information will be periodically distributed throughout the Colony. These institutions, especially the College, will, to a great extent, practically settle the questions how to make country life attractive to the youth of the Colony.
>
> In order still further to assist the agriculturists, it has been determined by the Minister for Agriculture to issue this *Journal*, which will supersede the former spasmodic publication of special bulletins. . . . The first number will afford a fair idea of the nature and partly of the scope of the publication, which will be issued . . . . each month, and will be posted gratis to the addresses of members of agricultural, pastoral and kindred societies.

The *Journal* originated from a series of official pamphlets called *Papers for the People*, which dealt with different branches of agriculture. Later, it was decided to issue a more authoritative series of departmental bulletins. On the establishment of the Department of Agriculture and Stock as a separate ministerial office in 1897, the need of a regular monthly publication was recognized and so the *Journal* came into being.

The first number of the *Journal*—Volume I, Part 1—was issued by direction of the Hon. A. J. Thynne, Minister for Agriculture, under the editorship of Major A. J. Boyd, F.R.G.S.Q., who continued in the editorial chair until May, 1921. In the course of his term of office Major Boyd became the friend of practically every farmer in Queensland. On the occasion of his retirement he was the recipient of appreciative notices of his great work in the cause of agricultural education from all parts of the Commonwealth.

During the half century of its existence, *The Queensland Agricultural Journal* has continued, it is believed, to fulfil its purpose in conformity with the aspirations of its founders as a beneficial influence on the progress of the land industries of the State.

Half a Century in Queensland Agriculture.

STORY OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

PART I.

J. F. F. REID.

BY Notice in the *Queensland Government Gazette* of 18th June, 1887, the Department of Agriculture was instituted under the control of the Secretary for Public Lands. The gazettal reads:—

Department of Public Lands,
Brisbane, 17th June, 1887.

NOTICE.

It is hereby notified for general information that His Excellency the Governor, by and with the advice of the Executive Council, has been pleased to establish a Department of Agriculture, to be managed by an Under Secretary, with the necessary staff, and under the direct control of the Secretary for Public Lands.

C. B. DUTTON.

Exactly ten years later the Department was separated from the Lands Department under the designation, Department of Agriculture with Colonel the Hon. A. J. Thynne, M.L.C., as the holder of the new portfolio.

The officers first appointed to the staff in 1887 under the Hon. C. B. Dutton were Messrs. Peter McLean as Under Secretary and E. G. E. Scriven as Clerk. On his appointment, the Under Secretary undertook a tour of the southern Colonies to study the organisation and services of similar Australian departments. Later in the year the Colonial Botanist, F. Manson Bailey, was transferred to the Department from the Queensland Museum.

Accommodation for the new department was provided in two small rooms, 14 feet square, in the Lands Office, George street. When the Commissioners for the Melbourne Exhibition vacated the building in William street on completion of their work, the Department was moved to the premises it now occupies and to which large extensions have been added from time to time. At first, the floor on the William street level was used as a museum of economic botany in which exhibits returned from the Melbourne Exhibition were arranged as a nucleus. These exhibits included specimens of Queensland native timbers in plank, block, and veneer. Additional exhibits necessitated the occupation of another floor for their display; according to a plan to show specimens illustrative of the wide range of Queensland's agricultural and pastoral resources.

THE FIRST DECADE.

As a lead up to the story of the Department from the date of its establishment in 1897 under its own ministerial head, it is expedient to review briefly some of its activities in the course of the preceding decade—1887 to 1897.

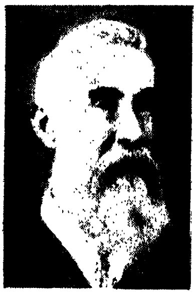
Queensland Ministers for Agriculture.

«»

Before 1897.

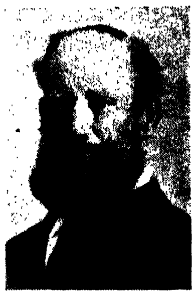
«»

Before 1897 there was no separate portfolio for agriculture in the Queensland Government. Agricultural matters were administered by the Minister for Lands or some other member of the Cabinet.



HON. C. B. DUTTON.
June, 1887-August, 1887.

HON. H. JORDAN.
August, 1887-June, 1888.



HON. M. H. BLACK.
June, 1888-August, 1890.

HON. A. S. COWLEY.
August, 1890-March, 1893.

HON. A. H. BARLOW.
March, 1893-May, 1896.

HON. A. J. THYNNE.
May, 1896-March, 1898.

Plate 1.

The first work of any moment undertaken by the Department was the distribution of seed wheat obtained locally and from the South. State nurseries at Mackay and at Kamerunga, near Cairns, were subsequently established.

The Travelling Dairy.

Early in 1889, plant for a travelling dairy was purchased and a manager, B. Jones, was appointed. Another unit was added for service in the North under the management of John Mahon, afterwards Principal of the Queensland Agricultural College at Gatton.

The Travelling Dairy commenced operations on 15th April, 1889, and in the course of its existence visited 166 country centres—108 in the Southern District, 12 in the Central District, and 46 in the North. In all, 2,168 farmers received tuition, and of that number 1,483 were in the Southern, 168 in the Central, and 517 in the Northern dairying districts, respectively.

At the time the Travelling Dairy started on its instructional tours there were, it was said, no cream separators in Queensland, no cheese factories, and no butter factories as they are known to-day. Butter was largely of farm manufacture, while locally produced cheese was practically unknown as an ordinary market commodity.

In 1889, butter imports to Queensland aggregated 781,442 lb. and cheese 1,297,222 lb. Exports for that year were:—Butter, 22,068 lb.; and cheese, 6,954 lb. The population of the Colony was then 406,658.

Eight years later, in 1897, butter imports were:—Butter, 240,866 lb.; cheese, 18,598 lb. Exports were:—Butter, 426,729 lb.; cheese, 3,268 lb. The population of the Colony was then 484,700.

In 1889, statistics of dairy production were, apparently, not considered as of sufficient importance to warrant inclusion in the tables of the Registrar-General. In 1897, however, dairying statistics were prominent in his annual report, as shown by the following figures:—1897 (dairy products)—Butter, factory made, 3,478,878 lb.; butter, farm made, 2,208,109 lb. Cheese, factory made, 1,897,272 lb.; cheese, farm made, 394,144 lb.

In 1897, butter factories numbered 164 (mostly small local units), operating 405 cream separators (excluding those in use by farmers). Milk supplies to these factories (or creameries) totalled 10,892,908 gallons.

This marked increase in production over the ten-year period was regarded as a result largely of the educational work of the Travelling Dairy, which also had a direct influence on improvement in dairy practice and herd standards during that period.

State Nurseries.

The State Nurseries at Mackay and Kamerunga, established in 1889, were designed for the raising of plants of economic importance and for experiments with those plants to ascertain their suitability for extensive cultivation under Queensland conditions. Sugar cane

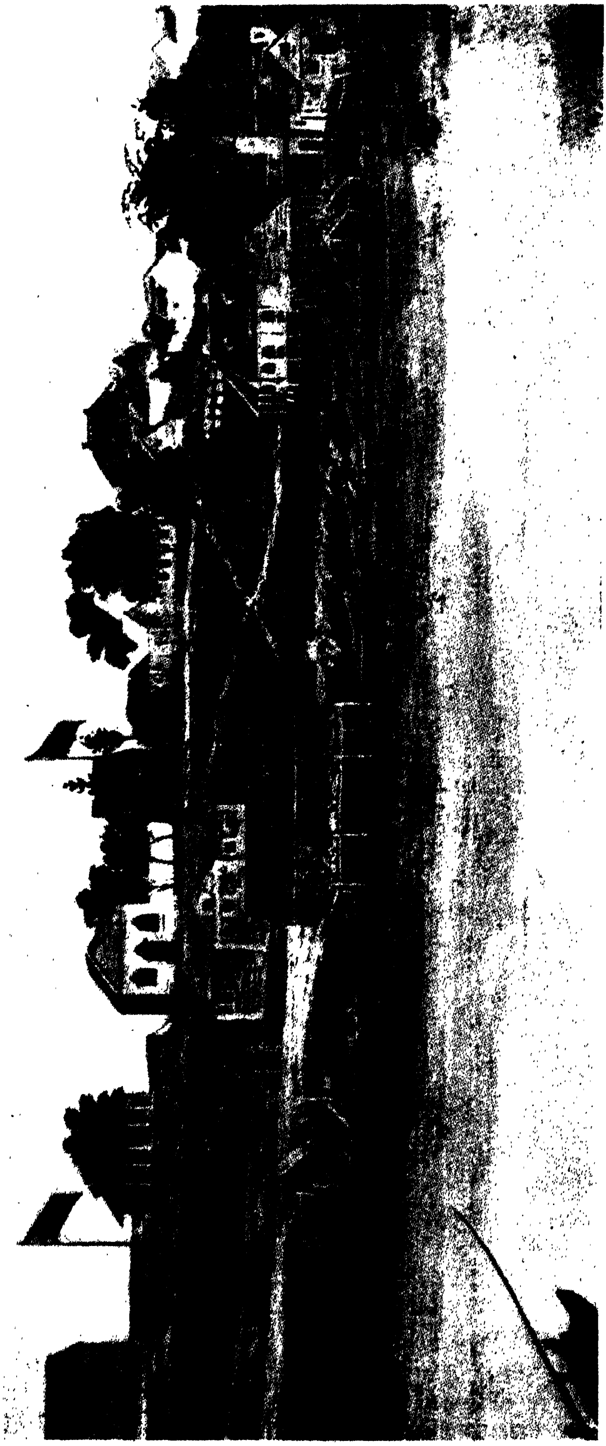


Plate 2.
SITE OF THE DEPARTMENT OF AGRICULTURE AND STOCK BEFORE 1865.

varieties new to Queensland, including some from New Guinea, were included in the propagation plots from which some notable results were obtained.

At the Mackay Nursery a chemical laboratory was installed to test the qualities of selected cane varieties.

First Instructor in Agriculture.

Professor E. M. Shelton, of Kansas (U.S.A.) Agricultural College, was appointed Instructor in Agriculture on the recommendation of the Secretary for Agriculture, United States of America, whose advice had been sought as to obtaining a suitable man "to give such instruction as may be found most likely to conduce to the advancement of agriculture in Queensland and who is well acquainted with the American methods of instruction and practical farm operation." The appointment was for three years as from February, 1890. It was extended from time to time until 1897, when Professor Shelton was appointed Principal of the Queensland Agricultural College. In the following year he resigned and returned to America. He was especially interested in the cultivation of grains and green manuring, and his name is associated with the introduction of the cowpea to Queensland as a means of maintaining soil fertility.

Coconut Planting.

In 1887, first plantings of coconut palms were made on islands off the coast with the assistance of Customs authorities, who provided the necessary sea transport. Later a cutter was obtained from the Harbours and Rivers Department for the purpose, and preparations were made to form plantations on the islands between Mackay and Bowen. Thousands of nuts were planted, but the formation of plantations ended because the cutter became unseaworthy and a substitute vessel could not be obtained. The chief difficulty met with in this work was the preservation of the plantations from fire and vandalism. Accessibility of the islands from the mainland and consequent depredations of camping and fishing parties spelled their doom. Besides coconuts, plantings of mangos, guavas, and kauri pine also were made on these islands.

Grain Crops.

Attention to grain growing and breeding dates from the institution of the Department. Among early importations were wheats from South Australia and India, and these were distributed to farmers free of charge. Before State farms were established and on which more systematic plant breeding was practised, experiment plots were cultivated at Allora, Roma, Springsure, Clermont, Barcaldine, Hughenden, and Herberton—places distant enough apart to determine the suitability or otherwise of wide areas of the Colony for grain growing.

In 1887, wheat land sown for grain totalled 8,248 acres and yielded 182,308 bushels. The population of Queensland was then 366,940 (fewer than that of Brisbane in 1947). In 1897, wheat land sown for grain aggregated 59,875 acres and the yield was 1,009,293 bushels. The full requirements of Queensland, however, were just under 3,000,000 bushels.

Ham and Bacon Curing.

Instruction in methods of ham and bacon curing was another departmental need of the early 'nineties, and arrangements were made with Mr. Watson, a ham and bacon curer of long-established reputation, to give a series of demonstrations wherever required. A plant was obtained and practical lessons were given to farmers on the same system as proved so successful with the Travelling Dairy—the farmers supplying the raw material and removing the plant from place to place in each district.

Subsequent operation of bacon factories made district to district instruction unnecessary, but it is claimed for the Department that its initiative and action gave some impetus to the establishment of bacon factories in the Colony. As with dairy products and wheat, pig meats were high up on the Queensland import list in respect both of volume and value sixty years ago.

Tobacco Growing.

To stimulate the cultivation of tobacco, an instructor, S. Lamb, was engaged in 1890. On the expiry of his term Mr. Lamb went to New South Wales under engagement in a similar capacity to the Department of Agriculture in the neighbouring Colony, but not before he had left his mark on the industry here. Seed of the best varieties were obtained from the United States and elsewhere, and the best known methods of tobacco cultivation and curing were applied, but little could be done at the time to overcome the trade prejudice against Queensland-grown leaf. Some manufacturers repudiated the departmental claim that there was a home market for well-grown and properly cured leaf. This repudiation notwithstanding, the stir caused by the interest taken in the instruction given to farmers by the Department forced Queensland-grown tobacco on to the market, and some business concerns undertook its sole manufacture. With continued low prices for their leaf, growers' interest in the crop naturally slackened, but revived from time to time as values slanted upwards to a fairer economic level.

State Farms.

By the end of the first decade of departmental history, State Farms had been established at Westbrook near Toowoomba, at the Hermitage near Warwick, at Gindie in the Emerald district, and at Biggenden in the Burnett district.

Westbrook was acquired under the *Agricultural Lands Purchase Act*, and its area was 431 acres. The site for this farm was chosen by Hon. A. J. Thynne and A. H. Benson. It was laid out originally for general farming and fruitgrowing. No provision was made for stock. For the first year the farm was under the management of H. A. Tardent who, on his transfer to Biggenden, was succeeded by H. C. Quodling, who afterwards became successively Director of Agriculture and General Manager of the Agricultural Bank. Under the new management Westbrook was developed as a stud stock farm. In 1897 various crops also were grown, of which cowpea was the most profitable in that year.

Hermitage, an area of 240 acres, was purchased from the Canning Downs Estate. The site was chosen by Mr. Benson. This farm, under the management of Mr. Ross, was worked for general agriculture and fruit production.

Gindie, in the Central Division, an area of 8,000 acres, was selected from Crown lands. It was established under the management of Mr. Watt, who afterwards transferred to the staff of the Agricultural College. He was succeeded by Mr. Jarrott, formerly of Laidley. This holding was designed to foster general agriculture in Central Queensland, principally wheatgrowing, but in after years its main purpose was beef cattle breeding.

Biggenden, with an area of 83 acres, under the management of Mr. Tardent, was designed as a crop demonstration farm in that part of the Burnett.

Diseases in Plants.

Plant diseases had long occupied the attention of the Department. Initial legislation had been advocated for some years before the first *Diseases in Plants Act* was introduced in the Queensland Parliament in 1893, but time did not permit of its passage during the session of that year. The advocacy of this measure in Queensland was prior to the action taken by the other Australian Colonies, although it did not become law until after the other Colonies had enacted similar legislation. This measure effected a great improvement in the quality of marketed fruit, and checked indiscriminate importation of plants from the South and elsewhere. At that time, action under this legislation was confined chiefly to inspection of imported fruits and plants. A provision for inspection of Queensland orchards and nurseries, for some reason or another, was allowed to remain in abeyance. Regulations under the Act were framed by a board representative of the several interests concerned. The first draft was the work of the Entomologist, Henry Tryon.

Noxious Weeds.

The Department was active at this period in the eradication of noxious weeds from Crown lands and from land reserves, in co-operation with local authorities. Although the system devised was apparently simple, local authorities had rather an indefinite idea of their responsibility for weed destruction. Powers provided in the *Divisional Boards Act* had not been extended to municipalities which, consequently, could not compel private property owners to clear their lands of noxious growths. For instance, within the boundaries of the municipalities of North and South Brisbane there were large infestations of Noogoora burr which the Colonial Botanist declared to be poisonous in the early stages of its growth. An effort was made in 1895 to destroy this weed, but the lack of power to compel property owners to co-operate rendered it futile. The destruction of this and other plant pests, including prickly-pear, was a "burning" question in 1897.

The Sugar Industry.

During its first decade, the Department was closely interested in the introduction of new varieties of sugar cane. Two expeditions were sent to New Guinea in search of canes likely to prove suitable for

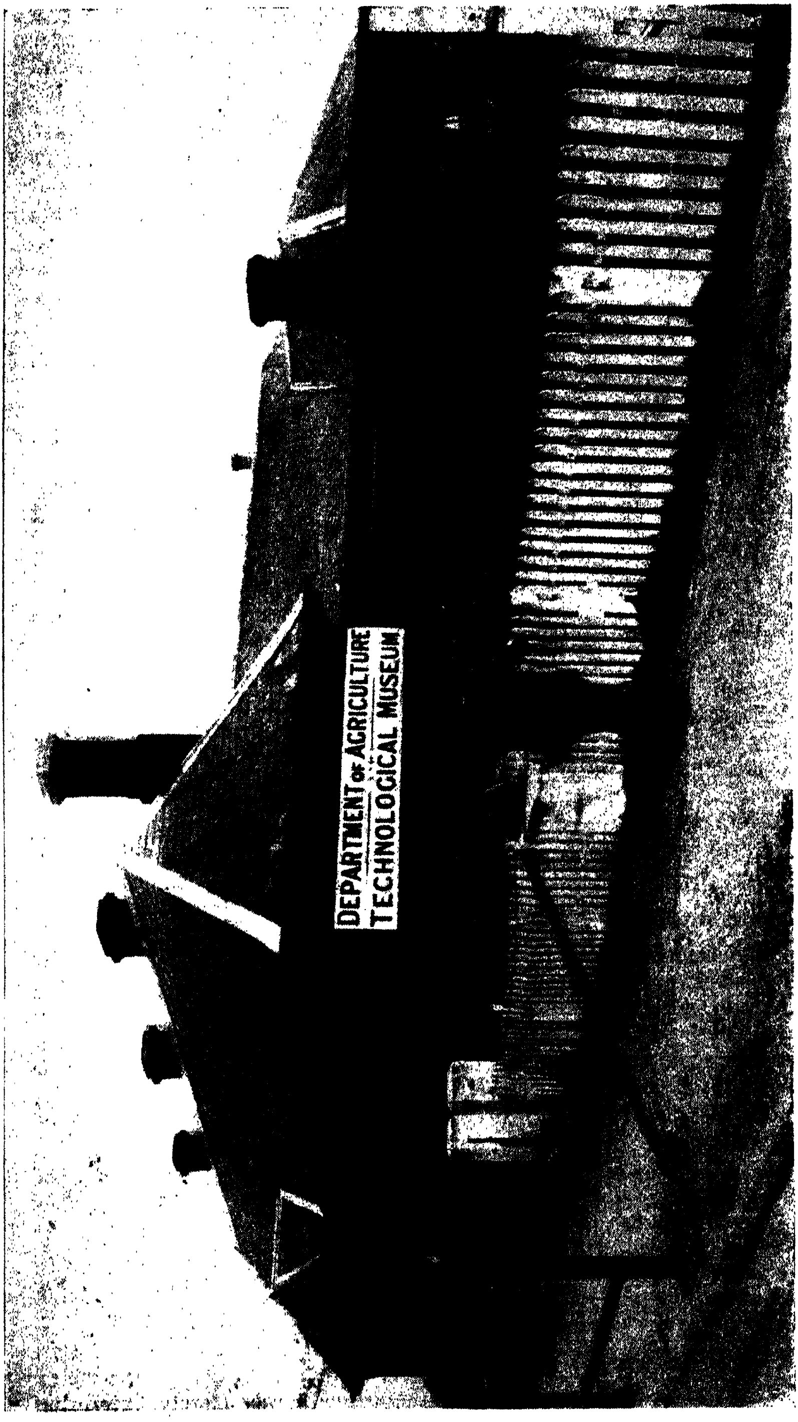


Plate 3.
DEPARTMENT OF AGRICULTURE ABOUT 1894.

cultivation in Queensland, one led by Mr. Cowley of Kamerunga and the other under the leadership of Mr. Tryon. Both expeditions achieved satisfactory results.

Cane plants were also introduced from Honolulu, Fiji, and elsewhere, but, on the whole, none compared with the introductions from New Guinea. In an early record it was said: "A cane to be remembered in connection with the sugar cane industry is the Kew Seedling cane received from the Royal Gardens, Kew, and successfully reared at the State Nursery, Mackay, whence the produce thereof has been distributed throughout Queensland."

An experiment in the transportation of cane sets from Queensland to Brazil, via Cape Horn, packed in rice husks in ordinary bags proved successful.

Before 1897 a movement towards canegrowing on small areas and away from the large plantation system was gathering impetus and the services of the Department were in strong demand for advice and information on the requirements of cane farming. During the period of depression after the financial crisis of 1893, inquiries on the subject came from all parts of Australia.

Expansion of the Department.

The public services of the Department expanded with the passing of legislation requiring effective administration of matters associated with the welfare and development of the land industries. This expansion during its first ten years was described by a former Under Secretary, Mr. Scriven, who, in a summary of departmental activities, said in September, 1898: "The work of the Department of Agriculture is so varied and different from other departments . . . that it can be said that no man therein knows from one day to another what work will be done; and some idea of the magnitude of this work may be ascertained when it is remembered that in June, 1887, there were but two men to constitute the staff, while in June, 1898, there were no fewer than 112 employed permanently, excluding gardeners, ploughmen, labourers, and partially paid men. The whole of the work done by these men is purely for the advantage of our farmers and pastoralists—the main body of the population. The Department does not administer repressive laws—all the work done is original, and so it can be fairly said that the Department of Agriculture occupies by no means a secondary position in the Public Service."

UNDER THE NEW REGIME.

In July, 1897, Agriculture became a separate State Department under its own Minister and with its own administrative and instructional staffs.

In his annual report for the previous year, the Under Secretary, Mr. Peter McLean, stated that the past year had been the busiest in the history of the Department. Many new departures had been made, among which was the transfer of the Stock Department; the inception of operations under the *Plant Diseases Act*; the establishment of the Queensland Agricultural College and the State Farms at Hermitage and Westbrook; the foundation of a pure-bred dairy herd; the International Exhibition; the advertisement of Queensland in Great Britain and Ireland and

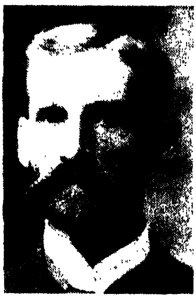
Queensland Ministers for Agriculture. Since 1897.

«»

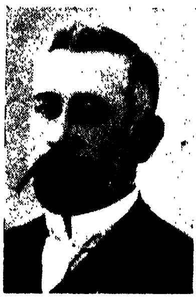
HON. H. F. HARDACRE.
December, 1899.

HON. J. V. CHATAWAY.
March, 1898-December, 1899; December, 1899. April, 1901.

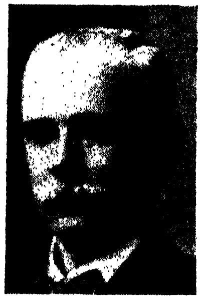
HON. D. H. DALRYMPLE.
April, 1901-September, 1903.



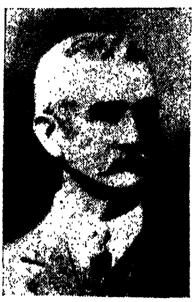
HON. DIGBY F. DENHAM.
September, 1903-February, 1907.



HON. W. STEPHENS.
November, 1907-February, 1908.



HON. T. O'SULLIVAN.
February, 1907-November, 1907; February, 1908-October, 1908.



HON. W. T. PAGET.
October, 1908-February, 1911.

HON. JAMES TOLMIE.
February, 1911-December, 1912.

HON. JOHN WHITE.
December, 1912-May, 1915.

Plate 4.

Germany with a display of samples of the products of the Colony; the publication of a monthly journal in place of the issue of bulletins at irregular intervals; the Agricultural Conference at Gatton; and the Intercolonial Fruit Conference. In addition, the ordinary work of the Department consequent on the establishment of a separate Ministerial portfolio had much increased.

This report was the tenth annual report of the Department, a circumstance which marked the completion of the first decade of its history. In no single year had so much progress been made. Crop returns, on the whole, had been satisfactory to farmers. Good rains had fallen over the wheat areas when needed and other settled districts shared in the benefit.

At that period, farmers' conferences, organized by the Department, were regarded as among the most effective means of stimulating production. Until then, these conferences had been district affairs, but none of them had been as successful as the All-Queensland Conference held from 10th to 12th of June at the Agricultural College, which was attended by primary producers from all settled parts of the Colony. The papers submitted were on well selected subjects, ably written and intelligently discussed.

The Third Intercolonial Fruit Conference was held in Brisbane and lasted from the 18th to 26th June, 1897. At the conference every Australian Colony, except West Australia, was represented; New Zealand also was represented. Associated with the conference was a fruit show in the Exhibition Building, which was regarded as the most comprehensive display of its kind ever held in Australia.

Dairying.

In January of that year, advantage was taken of the cold storage accommodation in the steamers of the British India Steam Navigation Company to send 63 tons of butter to London and which proved a profitable venture to the exporters. The companies which contributed to the consignment were the Central Downs Dairy Company of Allora; the North Ipswich Butter Factory; the Silverwood Butter Factory of Toowoomba; the Lowood Creamery Company of Oxley; and the Queensland Model Dairy and Fresh Food, Ice and Cold Storage Company of Brisbane. Up to that time the export of dairy produce had been intermittent and the success of this shipment gave an impetus to the dairy export trade. Previous exports to England were 9½ tons of butter in 1895, and 1½ tons of cheese in 1896.

The Travelling Dairy concluded its operations on 29th October, 1896. The growth of the co-operative idea among farmers led eventually to the manufacturing side of the dairy industry, and it was predicted that proprietary factories would soon give way to co-operative enterprise in butter and cheese manufacture. In this way, dairy farmers were following the example of sugar-cane growers who were interested in the establishment of sugar mills under the provisions of the *Sugar Works Guarantee Act*. It was pointed out, however, that before full value in the co-operative manufacture of dairy products could be assured greater attention would have to be given to breeding and feeding of dairy cattle.

A further opportunity was offered dairy farmers in the West Moreton, Darling Downs, Maryborough, and Bundaberg districts to obtain foundation stock by departmental sponsoring of competitions in herd improvement.

At that early day, concern was expressed on the possibility of margarine and margarine mixtures competing successfully with butter on the export market.

Wheat.

The area under wheat in 1896 was 35,831 acres, an excess of 7,741 acres over that of the previous year. This increase was regarded as "an infallible sign of the settlers' faith in the capabilities of the soil and climate for farming, and also of prosperity." The yield of grain was reported to be larger than that of "any other Colony in Australasia, the return being nearly 17 bushels to the acre." "Each year," it was stated, "brings forth fresh proof of the adaptability of the Queensland climate for the cultivation of wheat, and to those who understand the conditions under which this crop thrives there appears little or no reason why, instead of importing some 2,000,000 bushels of grain a year, we should not before long be exporting grain in some considerable quantities."

Some Victorians had settled near Emerald and had commenced operations on an extensive scale, but apparently success was not achieved outside the recognised wheat-growing areas of to-day.

Maize.

The cropped area for maize that season amounted to 115,715 acres, and the average yield was 26½ bushels to the acre. Prices were not satisfactory, however.

Tobacco.

Tobacco yields, although increasingly satisfactory as to volume, were affected by unfavourable markets and large stocks, for which no price could be obtained, had to be carried over. The result was that growers without incentive were losing interest in the crop. The excise duty imposed in 1894 was blamed, but it was pointed out the 2s. impost on imported leaf might reasonably be considered as a set-off. The cause of the fading interest in tobacco production, however, was not the excise duty, but the want of a market as a result of prejudice in favour of imported leaf. Queensland growers, it was reported, had not then learned sufficiently the arts of curing, grading, stripping, and packing to compete on an outside market.

Sugar.

Under the *Sugar Works Guarantee Act*, seven mills were then operating—Pleystowe, Marian, and Plane Creek at Mackay; Mulgrave at Cairns; Gin Gin, Mount Bauple, and Nerang River. The Central Sugar Mills at Mackay, North Eton, and Racecourse had continued to make progress and had paid all liabilities to the Government up to that time. The extension of small holdings continued to strengthen the demand for plant cane from Government nurseries. The total output of sugar for the year was 100,744 tons.

Fruit Export.

Two shipments of pineapples were exported to England in the course of the 1896-97 year. The first was a private experiment and a successful one, for the fruit reached London in excellent condition, but the fruit was too small in size and the prices realised were low. Another experimental shipment was sent to Canada and was delivered in good condition.

Rubber.

Rubber production was then a departmental interest, but efforts to establish it as a Queensland industry were not successful, largely because of the economic conditions associated with it. Para and Ceara rubbers were under trial at Kamerunga. Some years before, a rubber plantation had been established at Mourilyan Harbour by Messrs. Seymour and Allan, but when about to come into profitable bearing it was destroyed by a tornado.

Forestry.

Forestry was another departmental interest fifty years ago. A nursery had been established on Fraser Island; plantations, roads, and lands had been kept clean and nearly 7,000 plants had been set out. A change in the working of the nursery was decided on and it was handed over to the administration of the Home Secretary, who was to employ aborigines then living on the island. A hope was expressed in the Under Secretary's report that action would soon be taken to ensure protection for existing forests and so check the "wholesale destruction that is now going on."

FROM 1897 TO 1901.

Good average crops and fair market prices were recorded in the 1897-1898 agricultural year. Slowly, but surely, the production of the rural industries of Queensland was coming into line with out-turn of the other Australian Colonies. Queensland was naturally leading in sugar output, and average wheat yields were approaching equality with those of other parts of the continent. Increase in butter exports was attributed to the richness of the pastures of the dairy lands. Progress and development marked the administration of the Department. A fruit farm had been acquired at Redland Bay for experimental work in the control of pests of fruit and vegetables and for manurial trials. The conversion of the Government nursery at Mackay into a sugar experiment station had been decided. The *Diseases in Plants Act* became operative.

The *Queensland Agricultural Journal* had been a pronounced success from the issue of the first number in July, 1897. No less an authority than Sir J. B. Lawes, of Rothamsted, England, had written an appreciation of its usefulness and general get-up.

The transfer from the Home Secretary's Department of the Chief Inspector of Stock and his staff and the administration of the *Meat and Dairy Produce Encouragement Acts* increased the work of the Department. "The ordinary day is too short, and work has often to be carried far into the night," the Under Secretary reported to his Minister. Promised additions to the building, it was said, would "enable the whole

work of the Department (with the exception of the Stock Institute) to be carried on under one roof,'' and so lighten labour and facilitate operations.

Through the appointment of a tobacco expert, a complete change in methods of curing was anticipated. It was proposed to grow tobacco on the Agricultural College farm ''on such a scale as will afford a fair test of the value of our tobacco in the English market.'' A viticulturist also was appointed.

The Department was called on to provide relief for farmers of the Wide Bay district in the form of seed supplies, principally oats and lucerne, who had lost their crops in the disastrous flood of 1898.

It was found necessary to take over the property of the National Agricultural and Industrial Association at Bowen Park. On the revival of the Association in 1898, permission was granted for the holding of its annual show on the grounds, free of rent.

At that time, it was felt that district agricultural show societies were not earning the Government subsidies allotted to them, through their neglect to function as educational bodies. Against that, however, the parading of increased numbers of pure-bred dairy stock at country shows was regarded as a happy augury for the future of the export butter trade.

There was a lively interest in those days in loans in aid of co-operative agricultural production, chiefly in respect of advances for the building of flour mills on the Downs and in the Roma and Nanango districts. The only advance made in 1898, however, was to the Bundaberg Co-operative Dairy Company.

To attract attention to the agricultural resources of Queensland, the Department sent a comprehensive range of samples to the Greater Britain Exhibition of 1899 in London. Results in the prospective fields of immigration and Empire trade were greater than had been expected. Food and forestry products were chief features in the Queensland Court.

The establishment of wool sales in Brisbane on a firm basis in the course of that agricultural year brought in business that otherwise would have remained in Sydney.

The incentive offered by a bonus on chilled meat went far to strengthen the intercolonial trade. The bonus was payable only on meat sold within Australia and was not available for frozen meat exports overseas.

The Agricultural Lands Purchase Acts were fully operative at this period. Estates purchased between July, 1897, and June, 1899, were Glengallan No. 2, near Warwick; Fitzroy Park, near Rockhampton; Pinelands, Beauaraba, Clifton No. 2 and Clifton No. 3 on the Darling Downs; and Seaforth, near Mackay.

In June, 1900, Mr. P. J. McDermott succeeded Mr. Peter McLean as Under Secretary.

Plate 5.

STAFF OF THE DEPARTMENT OF AGRICULTURE AND STOCK, 1899.

THE TURN OF THE CENTURY.

In 1901, the colonial period ended with the inauguration of the Australian Commonwealth, of which Queensland became a State.

A new departure in departmental procedure that year was the reporting of departmental activities by the Minister direct to the Governor, instead of the Under Secretary presenting the annual report to the Minister, as had been the practice previously.

The gross departmental expenditure in the 1900-1901 agricultural year was £48,812, about one-hundredth part of the whole public revenue, or about 1s. 11d. for every Queenslander. Small as was this per capita cost it was more than the amount spent on agriculture by any other Australian State.

Weaknesses in agricultural organization in Queensland were discussed in the annual report of that year. In some districts an effort was made to bring neighbouring agricultural show societies into a sort of educational union; but, in the main, each association confined its interests to its own locality. In fact, it was found that proximity was more likely to produce discord rather than unity, and there were instances of associations in places only a few miles apart who were "at open war." There was no central co-ordinating body. Beyond holding annual shows and bestowing awards for exhibits not exclusively agricultural, these associations had done little or nothing of really educational value.

Because of facilities provided by the Railway Department it was reported that hundreds of farmers visited the Agricultural College in the course of the year to gain knowledge of the operation of new types of farm machinery, modern methods of cultivation, principles of stock breeding, use of fertilizers, and of the most profitable crops to grow. A similar service to producers was provided by the experiment farms in their respective districts. "The seed time of our agricultural education system," said the Minister, "is so recent that it is, perhaps, too soon to look for the harvest. One result, however, of this diffusion of technical knowledge is that almost everywhere the farmer is sensible of the value of scientific tillage, and is eager to master and apply its principles. Indications are not wanting, too, that on the whole agriculture is advancing . . ."

The prickly pear pest was attracting greater attention, and efforts were made by the Department to find a cheap and effective means of eradication. Bunker's Hill, a portion of the State farm at Westbrook, was the field of experiment, and it was estimated that to free land from pear generally would cost from £1 to £2 an acre.

In 1902, a reward of £5,000 was offered to the discoverer of effective means of destroying prickly pear at a reasonable cost by a process not injurious to animal life. Responses came from many parts of the world, but no one had yet undertaken to conform with the prescribed conditions. Many formulas for the eradication of the pest were offered by people overseas, but none was willing to give them a trial at his own expense. Moreover, all of the formulas submitted had already been tried in one process or another without satisfactory results, particularly in respect of cost of effective application. Oddly enough, alongside a newspaper announcement of the reward there was a paragraph stating that

cattle had fattened on prickly pear in districts in Queensland where, at the time, no other fodder was available. The co-operation of all authorities concerned was sought in preventing the further spread of the pest.

The greatest agricultural industry in Queensland was still sugar-cane growing. One-fifth of the cultivated land was under cane at the beginning of the century, and to sugar was credited three-fourths of the value of agricultural exports. The Registrar-General's figures for 1900 showed that the capital invested in Queensland sugar mills amounted to nearly £3 millions, the value of the product was nearly £1,900,000, the number of mills 66, and white people employed in the industry numbered 3,105.

The Sugar Experiment Bureau was established under Dr. Maxwell and so began a service, which in due course became a leading factor in the development of the sugar industry in this State.

Dairying had continued to make rapid and enduring progress. In 1900 there were in operation 53 butter and cheese factories and 146 creameries. The output for that year was 3,875 tons of butter and 886 tons of cheese. Butter exports totalled 620 tons. Pig raising also had made definite progress.

Short courses of instruction for working farmers were commenced at the Agricultural College in 1902. The dairy course was planned for the needs of dairy factory workers as well as farmers. Of 80 graduates of the College, all but two were then engaged in primary production; the two exceptions had entered engineering. The pure-bred dairy cattle at the College included Guernseys, Holsteins (Friesian), Ayrshires, South Coast (Australian Illawarra), and Shorthorns. The pig breeds were: Improved Berkshires, Middle, Large and Small Yorkshires, and Tamworths. A small flock of sheep included Romney Marsh, Shropshire and Merino.

The Chamber of Agriculture, formed at the Agricultural Conference at Bundaberg in 1901, had a successful year. Thirteen district agricultural societies had affiliated with the Chamber, only a small proportion of the 140 societies then in existence.

In the following year, only 18 out of 150 district associations had affiliated, but, geographically, the Chamber was fairly representative as agricultural organizations in Townsville, Bowen, Bundaberg, Beenleigh and Roma were among the affiliates.

The Agricultural Bank was brought into practical operation in April, 1902, by the appointment of Sir Hugh Nelson (chairman), E. Deshon and H. L. E. Ruthning as trustees. In the preliminary work of organization, the trustees had the assistance of W. C. Green of the Agricultural Department.

The export of frozen produce continued to occupy the attention of the Department. Difficulties in obtaining adequate refrigerated space in interstate shipping and, later, in getting sufficient cargo to fill the space available were experienced. It was felt that these conditions might continue until British shipping lines made Brisbane a port of call for

mail steamers which would ensure the availability of refrigerated space and so stimulate an increase in interstate cargo consignments of perishables, such as meat and butter.

A succession of dry seasons ended in 1904 and the extraordinary recuperative power of rural Queensland was again demonstrated. Pastures had fully recovered and a big natural increase in flocks and herds was a general experience in the pastoral areas. The greatest number of cattle—nearly 70,000—in the Southern Division was recorded at Esk. In the Northern Division, principally in the Gulf country, beef herd numbers had greatly increased and half the cattle in the State were then running on northern pastures. Wool exports also substantially increased.

On 1st January, 1904, Mr. E. G. E. Scriven succeeded Mr. P. J. McDermott as Under Secretary of the Department and continued in that office for 20 years, retiring in 1924.

CHANGE IN DEPARTMENTAL CONSTITUTION.

Up to the end of 1903 the Head Office administrative staff consisted of the Under Secretary, Chief Inspector of Stock, two chief clerks, an accountant, and 12 clerks. Agriculture and Stock were separate and distinct branches. The Stock Branch was under the control of the Chief Inspector of Stock, excepting in such matters as required the authority of the Head of the Department. On 31st December, 1903, the Under Secretary (Mr. P. J. McDermott) was transferred to the Chief Secretary's Office. The Chief Inspector of Stock (Mr. P. R. Gordon) had retired on 30th June. Consequent on these changes the Stock Branch ceased to be a separate entity. The change in the title of the Department to that of the Department of Agriculture and Stock was confirmed.

Although the Department had been naturally administrative, the main line of its activities had been educational and from then onwards its technical staff was progressively strengthened.

The annual farm conferences were continued and once a year representatives of every agricultural society in the State were invited to discuss rural industrial matters under the presidency of the Minister. Proceedings were carefully reported and subsequently printed for general distribution. Minor conferences of farmers engaged in specialized industry also were called from time to time, usually for the discussion of marketing matters. The idea was to maintain a system of co-operation between the Department and the primary industries, a system which has broadened greatly during the passing of the years.

The technical instructional staff in 1904 included the Government Botanist, the Entomologist and Vegetable Pathologist, instructors in fruit culture, inspectors under the *Diseases in Plants Act*, a tobacco expert, an instructor in coffee culture, the Agricultural Chemist, the Surveyor of the Meat and Dairy Board, the Inspecting Engineer under the *Sugar Works Guarantee Act*, and the Veterinary Inspector.

Up to 1904, 320 students had graduated from the Agricultural College.

A tobacco farm had been established on leased land at Texas, on which experiments in the control of blue mould were undertaken in addition to demonstrational work in the growing, picking and curing of tobacco leaf. This farm was paying its way.

Markets for agricultural and pastoral products within the Commonwealth and overseas were under constant study by the Department. There was a surplus production of malting barley in 1904. The Queensland product was regarded as of superior quality for malting and it was decided to send a trial shipment to test the English market. Accordingly, a consignment of 50 tons was despatched in February. The result of the venture was so successful that the Agent General cabled a recommendation that farmers should be encouraged to extend their acreages under this crop.

Tropical fruits had acquired a reputation for quality on southern markets and the Department was active in the fostering of this export trade. Results of oversea consignments, however, were not encouraging. Pineapples, bananas and tomatoes were among the chief interstate exports, and Queensland was the main source of supply of these fruits for the New Zealand market.

Oversea markets for maize were considered, but investigation revealed unsatisfactory prospects.

Agricultural education in country State schools continued as a live issue. The State farms were considered as a training ground for farm youths, and a system of apprenticeship was suggested.

The need for Government supervision of exports to raise standards of quality was stressed. It was considered that only commodities of prime quality should be shipped abroad.

By 1904 the area under field crops in Queensland had expanded to 566,589 acres. The number of people engaged directly in farming and dairying was 43,591; included in this number were 6,643 women.

The 1903 wheat crop had never been exceeded before in acreage and yield—138,096 acres and 2,436,799 bushels, respectively. As a wheat growing country, Queensland was definitely on the map, largely as a result of the wheat breeding activities of the Department. The State, however, was still short of its own grain requirements.

Dairy herd improvement was reflected in steadily increasing production. Breeding stock from the Government farms was in strong demand.

A travelling instructor in poultry raising was appointed this year, as the result of increasing interest in egg production as a profitable rural enterprise.

The need for crops besides sugar cane in the tropical districts was then recognized, and a lot of attention was given by the Department to the possibilities of producing fibres, such as sisal hemp and ramie, and other suitable products, but, generally, it was found eventually that the economic factor was against commercial success in the establishment of these crops new to Queensland.

Mr. H. C. Quodling succeeded Mr. Peter McLean (Agricultural Adviser) in 1905 and was designated Agricultural Inspector.

That year the administration of the *Native Birds Protection Act* was transferred to the Department. "This Act," reported the Under Secretary, "excellent in its intention and force is, by reason of the lack of interest displayed in its provisions by the public . . . somewhat difficult of administration. The area of this State is so large that to advocate the employment of people to supervise the enforcement of the Act is without reason and, consequently, excepting in those places where there are persons who are lovers of our native birds . . . the Act is practically a dead letter. It is to be regretted that there is not more enthusiasm shown in preserving the native birds, many of which serve a useful purpose in the destruction of insect pests; but the fact is patent and beyond argument that around our towns and places of settlement the native birds have seriously diminished, for which the ease with which young people of this State can acquire firearms, and the absence of the operation of any law with regard to the carrying of them, are largely responsible. It is advocated that some restriction . . . should be placed upon this facility for shooting. The Department, at some trouble and expense, is making a collection of birds that may be placed in the category of the friends of farmers; but of what use is the instruction, at the service of those who may wish to learn, if the wholesale destruction that is now allowed to go on by default is permitted to continue unchecked? What is everybody's business is nobody's business, and as the public will take no interest in protecting what is of value to them, it is time that restrictions should be placed upon those who have not the sense or knowledge of discrimination."

Almost 20,000 acres were under introduced pastures in 1905, largely as the result of the settlement of large areas of rain forest country, particularly in the Wide Bay and Burnett district.

It was predicted that provision for stored fodder would be needed as the dairy industry expanded.

Wheat growing was extending westward in the Maranoa district, where the area sown for grain had increased by 10,000 acres. This increase in acreage was attributed to the success of wheat experiments at Hermitage which had been planned to determine the value of these trial wheats for different districts. Demonstration areas were established in the Maranoa to ensure uniformity in cultural and other practices. For the Maranoa it was claimed that conditions of soil and climate were favourable to the growing of wheat and barley, and the importance of continuing experimental work in that district on an extensive scale to determine the many factors which make for success in the cultivation of grain crops was duly emphasised.

A need for greater publicity on the activities of the Department was met in January, 1906, by the institution of a news service by which the Press was to be supplied regularly with agricultural information. This information compiled from the monthly reports of the field officers was much appreciated. The newspapers in those days must have been very generous with their space for, as reported by the Under Secretary, "as issued they (the monthly reports) occupy from, say, five to six columns of the daily Press, but to bring reports down to that limit entails considerable work."

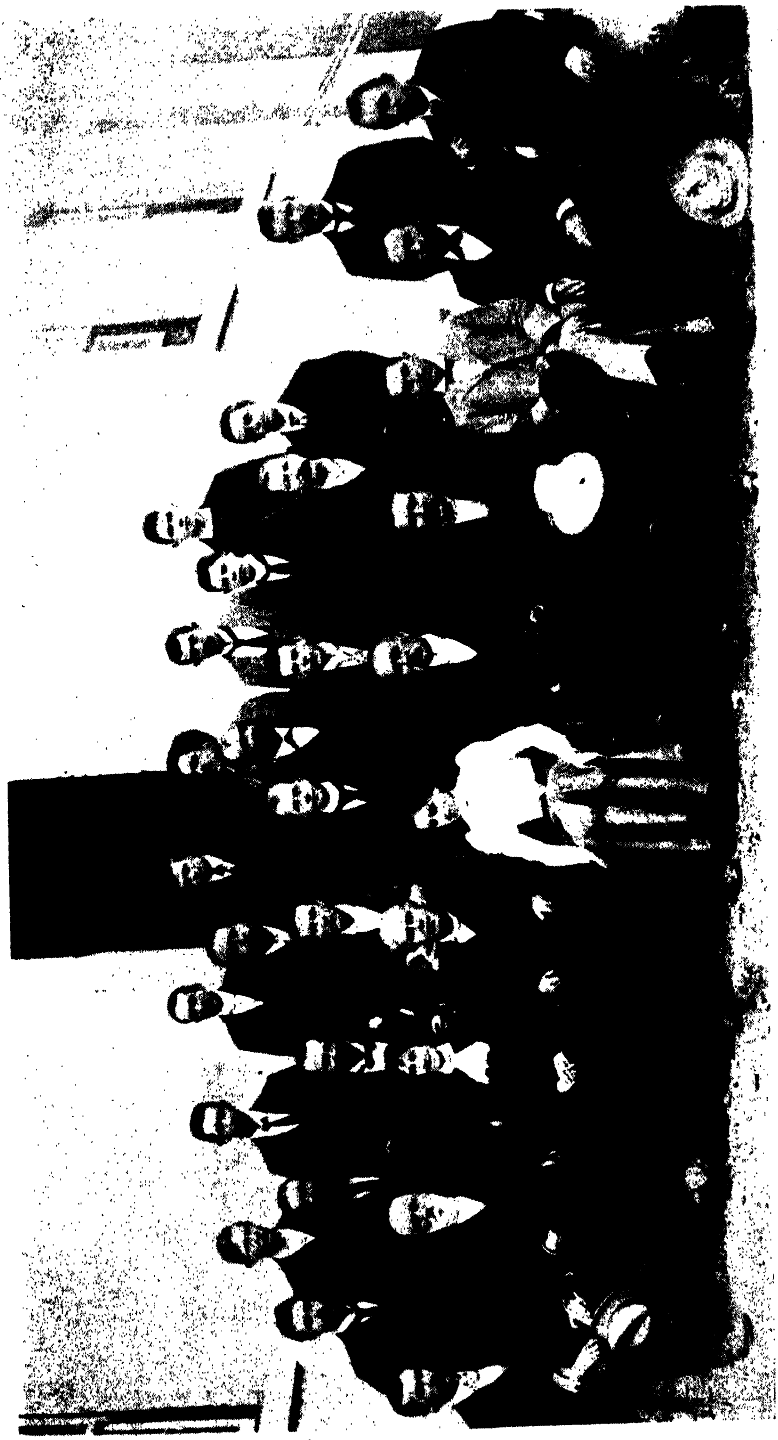


Plate 6.
STAFF OF THE DEPARTMENT OF AGRICULTURE AND STOCK, 1904.

New rural legislation which came into operation in 1906 included the *Dairy Produce Act;* the *Fertilisers Act;* the *Marsupials Act;* and the *Shearers' and Sugar Workers' Accommodation Act.* These, added to the many other statutes which the Department had been called upon to administer, naturally increased the work of the Department which was done without any addition to the administrative staff.

The 1906 report of the Agricultural Chemist is of particular interest, for it dealt in detail with milling tests of a number of Queensland wheats to provide a guide for farmers and flour millers. The fodder values of native and introduced grasses, sorghums, sweet potato vines, prickly pear and many other plants of actual and potential usefulness as stock food were also subjects of chemical analyses that year, which added greatly to the general stock of knowledge on pasture plants and animal nutrition.

A beginning was made with the training of youths with an aptitude for farming, and who were not in a position to take an Agricultural College course, at the Hermitage State Farm where accommodation was provided for ten boys. It was hoped that similar facilities would be provided at Kamerunga for training in tropical agriculture.

At its own cost, the Pastoralists' Association established a wool classing school that year, and it was suggested that this commendable move might well be backed up by the endowment of scholarships at the Agricultural College, in addition to the four bursaries granted by the State. The Department of Public Instruction also instituted a farming school for teachers at the College during their vacation.

The opening of an Intelligence Office within the Department on lines similar to the Inquiry Office within the Lands Department was mooted. It was pointed out in the 1906 report of the Department that its work was essentially associated with markets and marketing, about which exact information was very desirable. The idea behind the proposal was to have essential information immediately available to farmers and to the mercantile community. The functions of this Intelligence Office would cover, it was suggested, the obtaining and publishing of prices in interstate markets, and New Zealand, of such products as could be supplied by Queensland; the extension of the export trade of the State; the investigation of the requirements of the markets of the world in which Queensland might arrange business; the study of the conditions of supply and demand, as shown by production, imports and exports; and inquiry into matters affecting free movement of trade in primary products.

That year the Department sent representative exhibits of Queensland products, including timbers, to the Clark Centennial Exhibition in Oregon, U.S.A., and to the Australian Natives' Association Exhibition in Melbourne. Both displays brought many inquiries as to the rural resources of the State.

In those days, the Department was interested in the laying down of gardens in open places, similar to the Queen's Gardens which is still under departmental control and is one of the brightest spots in the City of Brisbane. The Queen's Park, Maryborough, was quoted as another example of this form of cultural development worthy of emulation. Other examples are the gardens in Toowoomba, the street gardens in Warwick, Mackay, Townsville, Cairns and Murgon. In Murgon, one of

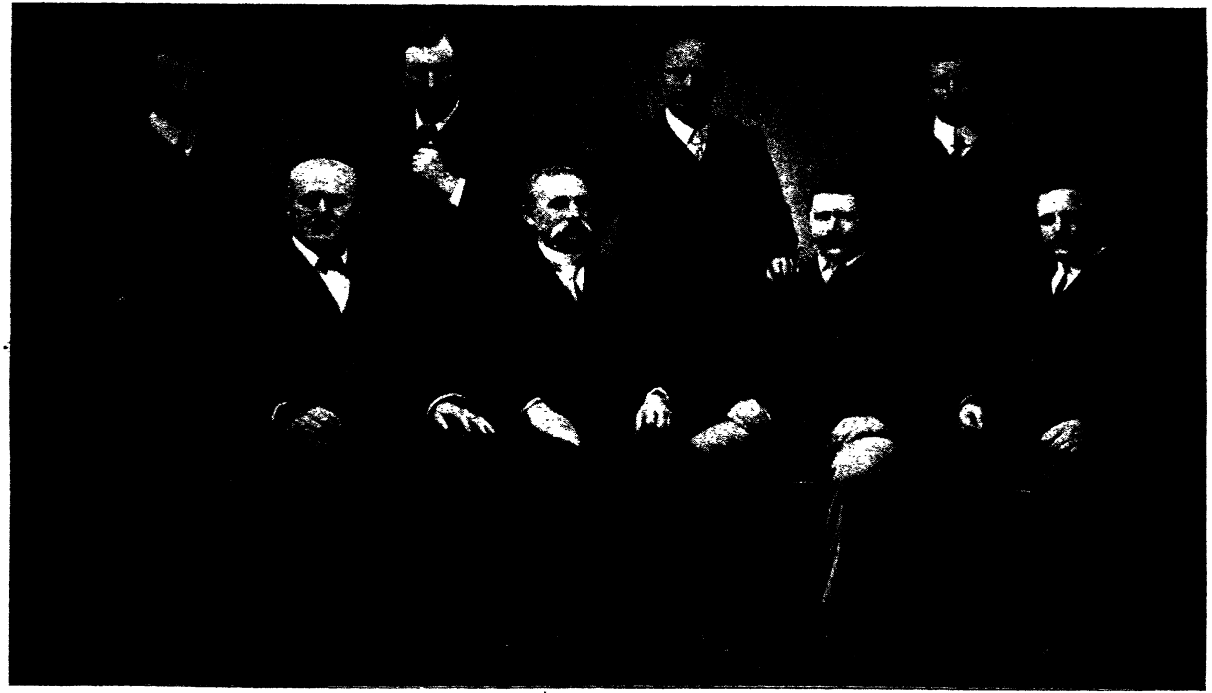


Plate 7.

FORMER SENIOR OFFICERS OF THE DEPARTMENT.

Seated (Left to Right).—Messrs. R. S. Neville, Instructor in Tobacco Growing; E. G. E. Scriven, Under Secretary; George Thompson, Supervisor of Dairying; Lieut.-Colonel A. H. Cory, Chief Inspector of Stock.

Standing (Left to Right).—Messrs. Mat. Fern, Poultry Expert; A. H. Benson, Director of Fruit Culture; J. C. Brunnich, Agricultural Chemist; and H. C. Quodling, Director of Agriculture, afterwards General Manager, Agricultural Bank.

the newest of Queensland towns, the centre of a three-chain street, a chain in width, was reserved and is now a tree-shaded pleasaunce. In all such enterprises, street beautification particularly, the advice of the Government Botanist has been available to local authorities from the earliest days of the Department.

A plea for the preservation of useful wild life, especially the native bear, was made in 1906 by the Department. The bear is now fully protected, as are also many other native animals and insect-eating birds.

An interesting item in the 1906 report was this comment: "The pessimism of the man who gave utterance to the statement 'that the Darling Downs would not grow a cabbage' still finds followers whenever a dry time comes or other difficulties prevent a high return of profit from the operations of a single year, but notwithstanding those who decry agriculture in this respect, a comparison of the returns in this and preceding years clearly shows that, with the population required to handle our lands in the way in which they should be treated, Queensland will surpass in her production all the other States of the Commonwealth." Wheat yield averages over the years were quoted in support of that opinion.

State farm activities that year were extended to Roma where land known as the Police Paddock at Bungeworgorai, near Roma, was selected for the establishment of an experimental area.

Dairying continued to make remarkable progress as new lands were opened up for settlement in many parts of the State. The remarkable extension of agricultural settlement in Queensland during the first decade of the present century will be the subject of a later chapter. Among the new settlement areas were the Kingaroy, Gayndah and other districts of the South Burnett; Tuchekoi, Mary Valley and other parts of Gympie district; rich belts of country in the Central Division; and the Atherton Tableland in the Far North.

New lands were made available for group and individual settlement on the Ideraway resumption, the Binjour Plateau, Cloyna, Murgon, Goomeribong, and Wallumbilla. Areas suggested to the Lands Department for inspection were the Gogango Scrubs, Obi Obi, Belli, Barmoyea, Goomboorian and land in the Western District. Among lands discussed or inspected were three more sections of Ideraway, Biggenden, Numinbah, Inkerman, and an area around Barcaldine.

In the course of this period, legislation relating to the dairy industry was through its operation largely instrumental in raising the reputation of Queensland butter and cheese in overseas export markets. Under this legislation all dairies and factories were systematically inspected, produce graded and practical advice and instruction given where needed. The even tenor of its operation, however, was somewhat upset by the Commonwealth *Commerce Act*, but eventually the administration of this Federal measure by State Officers was arranged.

[TO BE CONTINUED.]

Through Fifty Years.

THE QUEENSLAND AGRICULTURAL JOURNAL.

J. F. F. REID.

IN JULY, 1897, the first issue of *The Queensland Agricultural Journal* came off the press in Brisbane. In 1897, topmasts of sailing clippers berthed at Petrie Bight could still be seen from Queen Street, and port marks on horse-drawn lorry loads told of opulent overseas trade expansion. Still in the pre-petrol era, progress was on the way. Along macadamized riverside roadways the successful tide of life was even clangorous, but there was hardihood in the noise and on cargoes for ships, including trial consignments of Queensland butter for London, destination names showed how wide was our Empire and how assured was our security. There, too, were other symbols of prosperity of a new land that had come from fertile minds and busy hands quickened by discovery and desire.

In that year Australia, in common with other parts of the British Empire, commemorated the Diamond Jubilee of Queen Victoria; Queensland, then a colony, was preparing to join the Australian Federation; the long peace of the Victorian period was nearing its end; events were moving towards the climax of war in South Africa.

In the intervening decades revolutionary changes have occurred in the world of men and affairs.

In 1897 the population of this continent was less than 4½ millions, and of that number fewer than half a million lived in Queensland.

Of agricultural production in Australia, it was said at that time:* "Although considerable progress has been made of late years in some directions, yet it must be admitted generally that agriculture in the Australasian colonies has only now passed the tentative stage. The typical Australian agriculturist, relying largely on a bountiful Nature, does not exercise upon his crops anything approaching the same patience, care, and labour that are bestowed by the European cultivator, nor as a rule does he avail himself of the benefits of scientific farming and improved implements to the extent that prevails in America and Europe. It may be expected that improvements will take place in this respect and that the efforts made by the Governments of the various colonies for the promotion of scientific farming will bear good fruit."

Areas under the principal crops then grown in Queensland were: wheat (for grain), 59,875 acres; oats (for grain), 1,881; maize (for grain), 115,715; barley (for grain), 1,122; potatoes, 10,803; vines, 2,020; hay, 35,764; sugar cane, 83,093 (actually harvested, 66,640); fruit, 10,399.

Queensland livestock figures in 1897-98 were: sheep, 19,593,696; cattle, 6,507,377; horses, 452,207; dairy cattle, 125,000; pigs, 97,434.

In agriculture, as in other industries, there has been remarkable progress in Queensland during the past half century; and vast new areas of arable and pastoral land north and south of the Tropic have been brought into profitable production.

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* *The Seven Colonies of Australasia*, 1897-98—T. A. Coghlan, Govt. Statist., New South Wales.

MR. JOHN MAHON.
Principal Q.A. College.

MR. A. H. BENSON.
Instructor in Fruit Culture.

MR. R. S. NEVILLE.
Instructor in Tobacco Culture.

MR. H. TRYON.
Govt. Entomologist.

MR. E. H. RAINFORD.
Instructor in Viticulture.

MR. H. NEWPORT.
Instructor in Coffee Culture.

MR. WM. SOUTTER.
Inspector of State Farms.

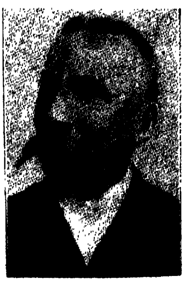
MR. J. C. BRUNNICH.
Chemist, Department of Agriculture.

MR. C. J. POUND.
Govt. Bacteriologist.

MR. W. C. QUINNELL.
Govt. Veterinarian.

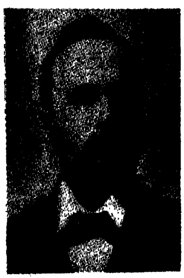
MR. F. M. BAILEY.
Govt. Botanist.

MR. P. MCMAHON.
Curator, Botanical Gardens.



MR. A. J. BOYD.
Editor, Q.A. Journal.

MR. F. C. WILLS.
Artist, Q.A. Journal.



MR. D. JONES.
Fruit Inspector.

In these days of scientific research into every conceivable problem of the universe and of life itself, it is difficult to realize the comparative want of accurate information about agriculture in this country fifty years ago. That need, however, was recognized by the Government of the day and included in its plans for the dissemination of agricultural knowledge was the establishment of a departmental journal through which current information on the science and practice of agriculture would be conveyed directly to farmers and others interested at nominal cost. *The Queensland Agricultural Journal* was accordingly brought into being and has now attained its fiftieth year of publication since its foundation.

Early Volumes Reviewed.

A complete review of the *Journal* would require a chapter for each decade of its fifty years to cover adequately its record of service to the land industries of Queensland.

In the first article of the first number, under the heading "Some Things We Need," the author reflects on "the present position in agriculture," sketches "the aims and objects of the Department of Agriculture," and refers to "the means by which the fulfilment of these aims and objects may be promoted."

From this article it is possible to form a picture of the conditions of rural industry in Queensland fifty years ago. Sugar and bananas had to be exported to other colonies where competition with other countries had to be met. The output of sugar had not yet satisfied the demands of the domestic market; bananas were still imported by the southern colonies from Fiji. In sugar especially "competition was very keen" and to exclude importations from Java the price of Queensland sugar was depressed to a point which made "the future of that industry . . . . a matter of some anxiety, and the time has certainly come when the strictest economy will have to be enforced in every direction to secure the safety of the industry." An influx of experienced farmers from elsewhere was reported.

"In all other products which we now only partially supply to ourselves," said the reviewer, "agriculture is in a transition stage, or on the eve of it; and it behoves us to look well ahead and prepare now for the completion of the process of change which will assuredly test to the utmost the capacity of the country and its people to resist strong competition. If we take stock of our materials, we have nothing to fear in point of soil and climate . . . . There is no better soil anywhere than we have lying at our hands largely unoccupied, and under our favourable climate two good crops each year can generally be obtained. The full utilization of these advantages depends upon our farmers and on the means they employ . . . . The skilled farmer who studies his surroundings and by means of his skill and experience overcomes all difficulties in the way of his success, is happily to be found in every farming district of the colony . . . . But, on the other hand, there are farmers who have settled on our lands without adequate previous training, and who frequently are discouraged by failure in the face of hard work and earnest endeavour.

"It is at this stage that the Department of Agriculture has come into existence, and such is the condition of affairs that it has to cope with. Its creation is a clear intimation that the people of Queensland desire it to become a great agricultural country, able to sustain a successful struggle with all other countries whose competition it has to meet. That is

concisely the aim of all Queenslanders who have faith in the enduring prosperity of the country. The first duty of such a department is to take the initiative in agricultural education.''

Among other needs discussed in the article was that of earnest co-operation of all primary producers with the Department of Agriculture and Stock, the Queensland Agricultural College at Gatton, and State Farms. The Department, it was claimed, had as its staff a body of specialists unsurpassed ''by any similar body in Australasia,'' and great and enduring results from their association with the rural industries of the colony was confidently anticipated. It was added, ''However excellent the teaching power or arrangements of the Department may be, however ready the people of the country, both young and old, to acquire the knowledge offered to them, no grand results can be achieved without the help of the farmers themselves.''

A strong plea was entered for the formation of associations of local producers. At a few places in Queensland the combination of local farmers had been productive of great benefits, but ''as a rule there is no section of the community more disorganized . . . . As a rule their efforts begin and end with their annual shows . . . . The holding of shows ought to have only a secondary place in the objects of farmers' societies . . . . At every meeting place of farmers, complaints are heard of the difficulty of disposal of their produce, the delays and expense of transport, the high interest on borrowed money, the expense and difficulty of getting good implements, and the high price of such necessaries as they cannot themselves produce . . . . Many are inclined to look upon the Government as a sort of Providence from whom all good things ought to come, and who should step into those fields of occupation which rightfully belong to individual enterprise . . . . It is not long since any attempt by a government to extend its tentacles into the private affairs of individuals would have been regarded as a deep design against the liberty of the subject, or a scheme by which it might acquire the power to crush them; and there is no saying when a state of affairs might arise when the temptation to use such a force might be too strong for resistance. The remedy . . . . . is mainly in the hands of the farmers themselves.''

With union, it was stressed, farmers ''can become so strong as to be able to control within reasonable limits the markets with which they deal . . . . they can equip themselves with all the means by which they may exclude foreign competition with their own products in their own markets; without union, their voices sound as discordant as those of Babel in the ears of a deafened and distracted Agricultural Department. With union, they can readily convey their sentiments to the intelligence of a sympathetic Minister . . . . and secure the removal of obstructions to progress, the adoptions of improvements, the passing of good laws and, finally, the raising of agriculture as a pursuit to the very high level to which it naturally ought to belong.''

''Organization Amongst Farmers'' was the title of another leading article in the first issue of the *Journal*. A meaty extract: ''Of the many associations of former years, the East Moreton Farmers' Association approached nearest to the ideal union. Farmers met regularly once a month, papers were read and discussed, exhibits of various kinds of produce were laid before the meeting, and emulation was stimulated by the successes of individual members. Ploughing matches were regularly held, and the interest taken in meetings was such as to create a bond of real union . . . .''

Other leading features in this first issue were: "A Paying Crop for the West" (the sweet potato), by Henry A. Tardent, Manager of Westbrook Experiment Farm; "Coffee-Growing in Cairns;" "The Dairying Industry in Queensland," by John Mahon, Government Dairy Expert; "Fruit Culture in Queensland," by Albert H. Benson, Government Fruit Expert; "Destructive Insects Liable of Introduction to Queensland," by Henry Tryon, Entomologist; "Bee-keeping for Extracted Honey," by H. Stephens; "India-Rubber," by E. Cowley, Manager, Kamerunga Nursery, Cairns; "Probable Meat Trade with Egypt; "Contributions to the Flora of Queensland," by F. Manson Bailey, F.L.S.; and a report of four sessions (continued in the following issue) of the Farmers' Conference at the Agriculture College, Gatton, on 10th, 11th, and 12th June, 1897.

Problems of the Time.

That conference in 1897 judging by the full report of it, was regarded as an event of great importance. Delegates, of whom a full list is given, were present from every agricultural and pastoral district in the Colony. The chairman was Colonel the Hon. A. J. Thynne, M.L.C., Secretary for Agriculture. Departmental officers present were Peter McLean (Under Secretary), Professor Shelton (Instructor in Agriculture), J. C. Brunnich (Chemist), John Mahon (Dairy Expert), A. H. Benson (Fruit Expert), and Major A. J. Boyd (Editor, *The Queensland Agricultural Journal*). J. V. Chataway, M.L.A., M. Battersby, M.L.A., P. Waller (Neusa Vale) and W. Soutter (Acclimatization Society) also were present.

In the course of his opening address, the chairman referred to the bulk handling of grain as he had seen it three years previously in Canada and the United States; the need for co-operation among farmers, particularly in the purchase of machinery; and the prospects of developing the export trade in dairy produce, which depended on the improvement of dairy herds.

Among the papers read at the conference were: "The Sugar Industry and its Requirements," by E. Denman of Mackay; "Sugar Bounties," by Hon. A. S. Cowley; "Climatic Difficulties, Pests and Blights in Northern Canefields," a discussion led by J. Lely (Ingham); "Sub-Drainage," by A. Watt (Beenleigh); "Importance of Chemistry in Agriculture," by J. C. Brunnich; "Bacon Pigs and How to Breed Them," by W. R. Robinson (Toowoomba); "Farm Implements," by Professor Shelton; "Farm Servants and Farmers," by T. H. Wells (Isis); "Irrigation in Queensland Agriculture," a discussion led by J. Lely (Mackay); "The Cultivation of Wheat and Barley," by William Deacon (Allora); "Breeding and Treatment of Dairy Cattle," by John Mahon; and "Farmers' Associations," by E. Swayne (Mackay).

Many interesting sidelights on agricultural thought and opinion of the period are revealed in the faithful *Journal* report of the general discussion on each subject, particularly in respect of wages and conditions in the sugar industry which at that time was carried on with kanaka labour. Pleading for the retention of Pacific islanders in the industry, one northern delegate speaking of the labour force on one big plantation said with apparent fervour: "I tell you honestly that were those 400 kanakas taken away, this gigantic co-operative plantation would collapse . . . . Gentlemen, you can, and will I trust, assist in making this suicidal policy impossible . . . . The opinion of all those who have

visited the sugar districts, and have seen for themselves, is that kanaka labour is an absolute necessity." In reply to a question by a Downs farmer, the man from Mackay said that sugar could not be successfully grown without black labour—that was his opinion after 33 years' experience.

Another delegate listed the wages paid for white labour in the canefields in 1897. Throughout one crushing season two gangs earned 25s. 6d. per man after paying for rations. New hands had earned at the rate of 18s. 3d. a week clear of ration money and another shilling for extras. Older hands on similar jobs earned 25s. a week clear of everything, and others made up to as much as £2 a week. Against that, in Queensland the kanaka cost the farmer 2s. 6d. a day.

Other statements on the canefield labour position at the time are equally interesting. "If all the kanakas in the Mackay district were taken away the industry would collapse," it was said. Farmers on the Downs had their labour worries too, it was asserted. One wheat farmer said that only recently he had offered two men who were doing nothing 4s. a day, but it was refused. Another cane farmer said that the kanaka question was one of economy and reliability and unless he could keep his labour he could not carry on his occupation as a cane-grower; as it was, he was handicapped by having to pay 2s. 6d. a day for cheap labour. Still another stated that every islander landed cost the planter at least £30. He formerly used to employ 90 boys, but he had leased his land to farmers to grow cane and had found this arrangement the most satisfactory. All these farmers, however, employed kanakas.

The discussion did not end, however, without vigorous opposition by southern farmers to the views expressed in favour of continued employment of coloured labour in the canefields. A Rosewood delegate, supported by neighbours from West Moreton, told the conference that farmers in his district did all their own work in cane cultivation without the aid of any coloured labour, although they got a much lower tonnage rate than the planters in the North.

The chairman tactfully steered the discussion into calmer waters, taking the broader national view, which was crystalized later in Federal legislation. The position of the Queensland sugar industry today, under Australian industrial conditions, is the obvious answer to the gloomy predictions uttered by some of the delegates to the Queensland Farmers' Conference at Gatton fifty years ago.

The Queensland Agricultural College.

Another notable event of that year was the opening of the Queensland Agricultural College at Gatton by the Governor, Lord Lamington. At the invitation of the Minister for Agriculture, Mr. A. J. Thynne, a large gathering, including many members of both Houses of Parliament, assembled in the College grounds. Departmental officers present were: Peter McLean, A. H. Benson, P. R. Gordon (Chief Inspector of Stock), John Mahon, C. J. Pound, Major A. J. Boyd, Henry Tryon and Professor Shelton.

Included in the College area was some of the best land along the Lockyer which had been purchased for £6,000. Including the cost of the buildings and other improvements the total outlay was £15,000. Accommodation had been provided for 60 students.

In the course of his opening address, Lord Lamington observed that within the area of 1,700 acres there were three distinctive soil types—rich alluvial, less fertile upland covering and a marshy tract—of which appropriate utilization would widen the experience of students in correct land use. The Government of Queensland, he said, had done the right thing in establishing such an institution which, he understood, was the first college in Queensland. The inauguration of the first college in the Colony was appropriately associated with agriculture to which the country was bound to look as its most productive industry. The institution might be regarded as "the generalization of the agricultural knowledge of the world, a kind of reservoir of which everything that is known or ascertained in regard to a particular science may be stored. Those who go out from it will, like rivulets from some system of irrigation, carry into their own localities all they have learned and gained, and afford a healthy stimulus to their neighbours in the development of the riches of the soil." Speaking especially to the students he added that if there were one defect in Queensland "it is that Nature here is almost too prodigal. In the case of individuals, as with mankind generally, adversity oftentimes produced success . . . . Students, when you go out into the world it will not be to engage in warfare. You have not to subdue some unfriendly foe. Nature lays before you, for your use her best resources. Your enterprise is indeed a peaceful one, and the furrows you will plough here or on the bosom of the rolling downs will serve to reveal rich treasures that are hidden. Your advance in time will take place on the great Western plains, and these will blossom in your wake. Corn, wine and plenty will spring from where you have trod . . . . Above all, I congratulate those who come here, as the first recruits of the great army which is to develop the lands of the Colony in the future, upon the facilities which are offered to them here to prepare for a career which is one of the most beneficial that is open to mankind."

The first College advertisement in the first issue of the *Journal* set out that it was open for the reception of students on 1st July, 1897. The College offered to Queensland youth a "direct education in the practice and science of farming. To carry out the intentions of the Government in this respect, the School has been liberally equipped for its proposed work. This equipment (in part) embraces—A Competent Staff of Teachers; A Farm consisting of 1,692 acres of land; Five Commodious Buildings; Dormitory Accommodation for 56 Students; Three Breeds of Dairy Stock; Implements, Apparatus, and Library."

Fees were fixed at £25 per annum, payable half-yearly in advance and a deposit of £1 as "a guarantee against damage of buildings and furniture. The fee covers board, washing, room rent, and lights."

Students were expected to work half-time in the field and half-time in study. Provision also was made for non-resident students.

The Golden Jubilee of the College was fitly celebrated in July, 1947, when its influence on the development of the agricultural and pastoral resources of Queensland during the past fifty years was duly acknowledged. In attendance were 400 relatives of students, ex-students and other visitors, including representatives of rural industry in all parts of the State. An added interest to the proceedings was given by the presence of six ex-students of the 24 whose names are on the original College roll. With seven others who trained there in the 'nineties, they answered a special roll call. The six originals are Messrs. R. E. Soutter, A. E. Holcombe, G. W. Jackson, C. J. C. Philp, A. R. Walker and H. C. Webb.

Mr. Soutter has since achieved especial fame as the breeder of some of Queensland's best wheats with developed characteristics of disease and drought resistance. He is still in the service of the Department of Agriculture and Stock as Wheat Breeder on the staff of the Division of Plant Industry.

Praising the valuable contribution old students had rendered to the land industries, the Minister for Public Instruction, Hon. H. A. Bruce, in the course of his commemoration address said that the College had proved the most important single factor in the development of the State. The rural resources of Queensland were so great and its area so vast that there was need for similar institutions in the Central Division and in the Far North. Probably the finest tribute that could be paid to the College, he added, was the fact that so many farmers who had been students themselves had sent their sons to Gatton to learn still more about farming.

Mr. E. F. Youngman, a student of 1898, recalled the late John Mahon, who was then in charge of the Government travelling dairy, demonstrating in that year the advantages of the first cream separator.

A fitting finale to the celebrations was a cavalcade of farm machinery, as used at the College from earliest times. Old horse-drawn ploughs were seen in operation against modern tractor-powered ploughing and cultivating equipment. The demonstrations included old-time broadcasting of seed by bucket and tray alongside the rapid mechanical devices of to-day.

Animal and Vegetable Pests and Diseases.

From the beginning, pests and diseases affecting stock and crops received a full measure of attention in every volume of the *Journal*.

The cattle tick received its first mention in the August issue in 1897 in the form of a progress report to the Chief Inspector of Stock from Dr. J. S. Hunt, who was carrying on experiments for the treatment of tick fever near Hughenden. The experiments were designed to ascertain the extent of the immediate danger incurred in inoculating clean cattle with various quantities of blood from a recovered beast; the protective efficacy of such inoculations; and the protective efficacy of small daily doses of arsenic. Results confirmed the merit of inoculation.

Prickly pear as a pest also got its first mention in the first volume.

Wheat Growing in the West.

In the February, 1898, number is an account of successful wheat-growing at Barcaldine by bore water irrigation. The first experimental plot was sown by Professor Shelton in July, 1895, but that and a sowing in the following year came to nought, because of insufficient rain. Irrigated crops, however, yielded up to 30 bushels to the acre. But it was obvious that grain-growing under natural rainfall conditions was too risky in the western country.

Near Roma, 6,000 acres were under wheat in the 1897 season, and 5,000 acres were harvested for grain; the remaining 1,000 acres were cut for hay. The variety sown was Allora Spring and individual yields were as high as 30 bushels to the acre. One farmer from Victoria stated that if the land around Roma was offered for selection in the southern Colony it would be rushed.

Farmers' Co-operation.

The benefits of co-operation and farmers' organization have been constantly kept under the notice of *Journal* readers from its earliest

issues. The formation of co-operative manufacturing and marketing associations have been fully discussed and every stimulus has been given to thought and action along these lines.

Today there are co-operative dairy associations, bacon factories and other media of mutual help throughout Queensland as part and parcel of our rural economy.

Typical of farmers' organizations early in the 50-year period under review was the Logan Farmers' Industrial Association, which at its regular monthly meetings arranged for the reading of papers on rural affairs by departmental specialists and practical farmers. For example, at its meeting in the Beenleigh School of Arts on 28th January, 1898, subjects fully discussed were "Farming and Dairying in Queensland," "Marketing of Australian Produce in England and Other Countries," and "Milking and Treatment of Milk." Farmers present were urged to co-operate with other similar associations and make known the result of their meetings through the medium of the *Queensland Agricultural Journal*.

At these meetings there was no "pulling of punches." Candour and straight speaking were encouraged. For instance, the Dairy Instructor of the time, John Mahon, did not hesitate to tell his audience at Beenleigh that during his travels throughout the Colony, although he had met some very good farmers who could hold their own even in countries where perfection in agriculture was claimed, he had also met "very lazy, careless ones, who were never intended for the land, and need never hope to be successful. Such men are generally found to be faddists or theorists . . . ." Continuing, this "straight shooter" said that in his opinion "there is a class of undesirable settlers: such as those who have no knowledge of tilling the land, who allow the Chinaman to take away the manure, who buy their vegetables from the Chinaman, and produce nothing from the land to supply their own households, and also secure a larger scope of land than their means will warrant." He did not shrink from tilting at the land policy of the period, by which areas designed for closer settlement were far too small for farmers to make a decent living. But he had a strong faith in the future of Queensland, a future "beyond the expectation of the most sanguine person." "There is no denying the fact," he said, "that no Colony in Australasia, and perhaps no country in the world, affords the same facilities for any branch of farm life as Queensland does at the present day. We have sufficient excellent agricultural land to carry millions of people . . . . . land which can be purchased at prices which I consider a gift. This is not only my opinion, but also that of practical Southern farmers who would never have visited this Colony had it not been for my inducing them to do so; needless to say, some of these farmers have disposed of their Southern homes and are now permanent residents of Queensland; others also are endeavouring to sell their holdings with a view of settling here . . . . These facts lead me to believe that there will be a great rush for agricultural lands in this Colony in the near future."

Extension of Land Settlement.

Just before the turn of the century, the tide of migration was setting in from the South. Enterprising farmers were coming from New South Wales, Victoria, and South Australia to take up land in Queensland. The vast areas of available virgin "scrub" country, regarded by early

pastoralists as valueless, was the main attraction to Southern dairy farmers particularly. Excepting those who had come from the "Big Scrub" on the rivers below the Border, the seemingly impenetrable jungles presented to the newcomers many problems. For their benefit and for others also inexperienced, much space was given in early volumes of the *Journal* to instructive articles on methods of clearing rain-forest and bringing under grass or into cultivation the extraordinarily rich volcanic soils it covered.

The past half century was remarkable for the extension of close settlement in districts in which natural conditions of soil and climate were adaptable to more intensive cultivation. Under the conditions of agricultural farm selection, both freehold and perpetual leasehold, many new farming districts, all richly endowed with the basic requirements of successful settlement, have been brought into highly profitable production.

Among the new areas of settlement were the South Burnett, Gympie, Central and Upper Burnett, Dawson Valley, the Northern Darling Downs, Chinchilla to Roma, Tara, Miriam Vale, Port Curtis, Eungella, Charters Towers, and Atherton Tableland districts.

New settlers flocked in from the older settled districts of Queensland —Fassifern, East and West Moreton and the Darling Downs—to the new lands further west and north. Added to that migration was the big influx of experienced farmers from the southern States. Some came overland, as in the covered wagon days, with their stock and plant to open up the rich untilled territories of Queensland. Young, vigorous and enterprising, these new settlers, both Queenslanders and Southerners, by their success became a definite influence on the progress and prosperity of the State.

Forestry.

In the early volumes of the *Journal*, forestry and the need of conserving the forest wealth of Queensland were subjects of regular editorial features. The "apathy with which the majority of our fellow-colonists, who are not immediately interested in the timber trade, view the question of a future supply of one of the most important of our natural products is as surprising as it is culpable" was regularly deplored. Denudation of timber on hill slopes was strongly denounced as a cause of serious soil erosion and the silting of watercourses. Recommendations from the 1890 reports on forest conservancy by P. McLean (Under Secretary), P. MacMahon (Curator of the Brisbane Botanic Gardens), and A. McDowall (Surveyor-General) were repeatedly quoted. "Suddenly, when the depredations of a careless population have produced the inevitable results," it was said, "the subject of forestry conservancy will assume a prominence not yet accorded to it, and it will be a matter of general wonder that our short-sightedness did not allow us to realize that destruction without replenishment must lead to scarcity." Again, "Forests were made for the use of man, and, if properly managed, a perpetual supply of timber for all purposes could be maintained. This has been practically demonstrated by saw-millers who held large timber selections in the Noosa district at Lake Cootharaba. These far-seeing men kept up a regular supply of kauri and hoop pine by judicious systematic thinning."

"In the early days of settlement in Queensland, when agriculture received little or no attention, the dense scrubs in the South on the banks of the Brisbane and the Logan, Albert, Pimpama, Coomera, Nerang, Pine, Caboolture, Maroochie; and, in the North, the Burnett, Mary, Johnson, Barron, Bloomfield, and other eastern rivers were rich in supplies of magnificent hoop pine, kauri pine, cedar, beech, silky oak, yellow wood, and other valuable timbers." The destruction of all species of eucalypts in the forest lands by ruthless ringbarking and thoughtless and greedy exploitation also was deeply deplored. "In time, splitters and timber-getters got to work and 'picked the eyes' out of the country. Then commenced the losses and the waste."

Years were to elapse, however, before a Forestry Service was established to conserve and control the timber resources of the State.

Introduced Pasture Grasses.

New settlers from below the Border brought with them small quantities of paspalum seed (as much as 10s. was paid for a match-boxful), and this new pasture grass was first mentioned in the *Journal* of April, 1898. The grass had been brought to the Richmond River district about five years before, where it was regarded as the best fodder or pasture grass yet introduced into that area.

Rhodes grass was another importation, supplanting paspalum in many "scrub" areas. Both grasses, as well as kikuyu and other introductions, are now well and widely established in every dairying district in the State.

Fish.

Fish was the subject of many *Journal* articles during its first decade. Native species and their habits were fully described. The introduction of trout for Border streams was advocated from time to time.

Tropical Agriculture.

Tropical fruits and other economic plants, especially coffee, have been regular features, but, in the course of time, the cultivation of many was proved more or less uneconomical under Queensland conditions. Those which could fit in with our economy naturally survived and continue to contribute very largely and on an expanding scale to the national wealth.

Agricultural Conferences.

Agricultural conferences were fully reported in early *Journals*, and the proceedings of one at Warwick in June, 1900, were regarded as so important as to warrant the publication of a supplementary volume. Previous annual conferences had been held at Gatton (1897), Rockhampton (1898), and Mackay (1899). The Warwick conference continued for four days, and in attendance were 114 representatives from farmers' associations and show societies throughout Queensland under the chairmanship of the Secretary for Agriculture, Hon. J. V. Chataway. Officers of the Department present were: P. McLean, A. H. Benson, S. C. Voller (Assistant Instructor in Fruit Culture), R. S. Nevill (Tobacco Expert), W. Soutter (Inspector of State Farms), C. Ross (Manager, Hermitage State Farm), and H. C. Quodling (Manager, Westbrook State Farm).

The subjects discussed at this farmers' "parliament" are worth recalling as burning questions in rural circles at that period. Some of them are still topical in present-day debate. Here is a copy of the Warwick agenda, leaving out the formalities:—The Progress of the Dairy Industry; Dairy Inspection; Cultivation of Sugar-cane; Our Climate; Farming and Education; The Functions of Agricultural Societies; Fruitgrowing on the Darling Downs; Strawberry-growing; Fruit for Export; Some Pests; Cultivation of Malting Barley; Lucerne and Prairie-grass Culture; The Vexed Question of Bags and Bales; Co-operation and How to Make Practical Use of It; What Tariff would be most suitable to Queensland Farmers under Federation; Freetrade or Protection; The Farmer as a Politician; Advantages Derived from the Repurchase of Lands on the Darling Downs; Agricultural Credit; Farm Manures; Timbers of Queensland and Forest Conservancy; Our Export Markets; How Far Black Labour is Required in the Sugar Industry; The Orange and Its Cultivation; and Beekeeping and Its Difficulties.

Horse Breeding.

Before the day of the farm tractor and mechanical transport, the horse was an indispensable factor in rural industry, so naturally breeding and horse-mastership were regularly discussed. A big trade with India had been built up. The South African War requirements intensified interest in the breeding of Army remounts, gunners, and other transport teams. Army authorities called attention to threatened deterioration in horse-breeding standards for both domestic and military purposes and contributed special illustrated articles to the *Journal*. The importance of the industry was stressed, and it was pointed out that "The climate, soil, capital available, and the excellent thoroughbred stock existing in Australia alike contribute towards making Australia generally a horse-producing country." A tax on stallions was suggested as a means of maintaining the high standards already attained. Horses required for military service were the heavy cavalry horse of bone, quality, and power, 16 hands; the light cavalry horse of good body and quality, 15·2 hands; the artillery horse of power and activity, 15·2 to 16 hands; and the transport horse of bone and power, 15·2 hands. The demand for these classes continued to the end of World War 1. In later years, however, the progressive mechanisation of agriculture, communication and transport reduced the demand for military and other utility classes. The horse versus the tractor for farm work has continued as a subject of controversy, and the day of the horse, especially on small holdings, is not yet done.

Irrigation of Farm Crops.

At the beginning of the century the decrease in the practice of irrigation was deplored in successive issues. The report of the Registrar-General on irrigation in Queensland for 1899 disclosed a striking decrease in the number of acres irrigated, compared with the area watered in the preceding year. In 1898 the area under irrigation was 9,648 acres (50 per cent. increase on the area previously irrigated), and in 1899 was only 6,311 acres. Curiously enough, the greatest diminution that year was in the Burdekin Delta, where to-day a remarkably effective irrigation system is in operation. Cogent comment in the report was on the "non-utilisation of the rivers of fresh water running through the rich lands of the seaboard where sugar is cultivated, as compared with Java. . . . The whole question of irrigation is deserving of much

more attention than it has received." To-day, irrigation is a very live matter in this State, and water supply and its use in crop growing is continuously expanding as the result of a planned policy.

Agriculture in the Schools.

Agriculture as a subject in school curricula was the theme of many contributions from time to time. One earnest advocate proposed that the importance of farming and its high honour as a calling should be impressed continuously on the minds of Queensland youngsters, especially those attending country schools, who should be "convinced that the farmer carries on an honourable and independent business; that agriculture is the most important of all national industries. . . . . To reach this highly desirable result, the germ of it must be implanted in the mind of the young pupil by giving him correct ideas of the conditions under which the agricultural industry must be carried on at the present day. There is no one so well able to work upon the intelligence, the tendencies, and the tastes of children as the capable instructor who is imbued with a deep sense of the noble mission confided to him. . . . . The profession of the farmer does not solely consist, as some even yet believe, in a routine or in machine-like work which the first-comer can rapidly acquire without any effort by personal experience or by observing how things are done in his neighbourhood. On the contrary, it is a science which must be carried on by intelligent people, who know how to get at the why and the wherefore of the operations as numerous as they are varied which they undertake. It is not, therefore, sufficient to bring under their notice, but to make them see and understand the different kinds of work done in the fields, the orchards, and the farms. It is the most suitable means of making them acquire a reasoning knowledge, a knowledge of daily application concerning the cultivation of various plants, the study of domestic animals, of parasites, of the nature of arable soils, of the value and action of manures, of the multifarious labours of the farm."

In Later Years.

Within the scope of a single article it is impossible to review in detail the leading features of the *Journal* throughout its fifty years. Each decade was a period of remarkable progress in the development of every branch of primary industry. Advances in the science, practice and extension of agriculture and animal husbandry are recorded in *Journal* volumes, nearly one hundred now in number, which also contain much of the history of the Department of Agriculture and Stock and, therefore, of Queensland rural industry.

The editorial post in any official monthly periodical is no sinecure. The editor has to solicit contributions for his publication, he has to cultivate a pride in the literary craftsmanship of those who supply material for his pages, and he must insist on technical accuracy in any manuscript passing through his hands.

The standards established in the early years of *The Queensland Agricultural Journal* by its first editor have never been relaxed. This in itself is evidence of the close collaboration which exists between all those officers of the Department of Agriculture and Stock whose interest in and contributions to the *Journal* make it what it is today. This is not surprising when one reflects that the Department is designed to serve all engaged in primary industry in the State, and to whom the *Journal* is a direct channel of communication.

Plate 9.

Mr. A. F. BELL, M.Sc., D.I.C., A.A.C.I., Under Secretary, Department of Agriculture and Stock.

NEW CHIEF OF THE DEPARTMENT.

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Appointment of Mr. A. F. Bell as Under Secretary, Department of Agriculture and Stock.

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MR. A. F. BELL, M.Sc., D.I.C., A.A.C.I., Assistant Under Secretary (Technical), Department of Agriculture and Stock, has been appointed Under Secretary to the Department as from 1st July.

Mr. Bell received his early education at the Ipswich Grammar School, entered the Public Service as an Assistant in the Agricultural Chemical Laboratory early in 1916, and later enlisted and served in France and Belgium with the 46th Battery, Australian Field Artillery, A.I.F., in the 1914-18 War.

He completed his course for B.Sc. degree at the University of Queensland in 1923, and in 1924 was awarded a Sugar Research Travelling Scholarship. He travelled extensively, visiting most sugar-producing countries. He completed courses at the University of California, at which he attained his M.Sc. degree, and London University, at which he obtained the diploma of the Imperial College of the West Indies. For sometime he was attached to the staff of the well known Experiment Station of the Hawaiian Sugar Planters' Association in Honolulu.

On his return to Australia, Mr. Bell was appointed Pathologist to the Bureau of Sugar Experiment Stations. He became Assistant Director in 1935, Acting Director in 1943, and Director of Sugar Experiment Stations and Assistant Under Secretary (Technical) in 1945.

In 1926, Mr. Bell represented Queensland at the International Botanical Congress at Ithaca, New York, and in 1932 he represented the State at an International Sugar Conference in the West Indies.

During the war Mr. Bell acted as State Executive Officer of the War Agricultural Committees, and served with the Volunteer Defence Corps as a Brigade Major. At present he is Deputy Chairman of the Bureau of Investigation of Land and Water Resources, a member of the State Committee of the Council for Scientific and Industrial Research, member of the Faculty of Agriculture in the Queensland University, and a member of the Australian Chemical Institute. He is a past President of the Australian Institute of Agricultural Science and the Queensland Society of Sugar Cane Technologists, and has travelled extensively in the agricultural and pastoral areas of the eastern States of Australia. He also is a member of Brisbane Legacy.

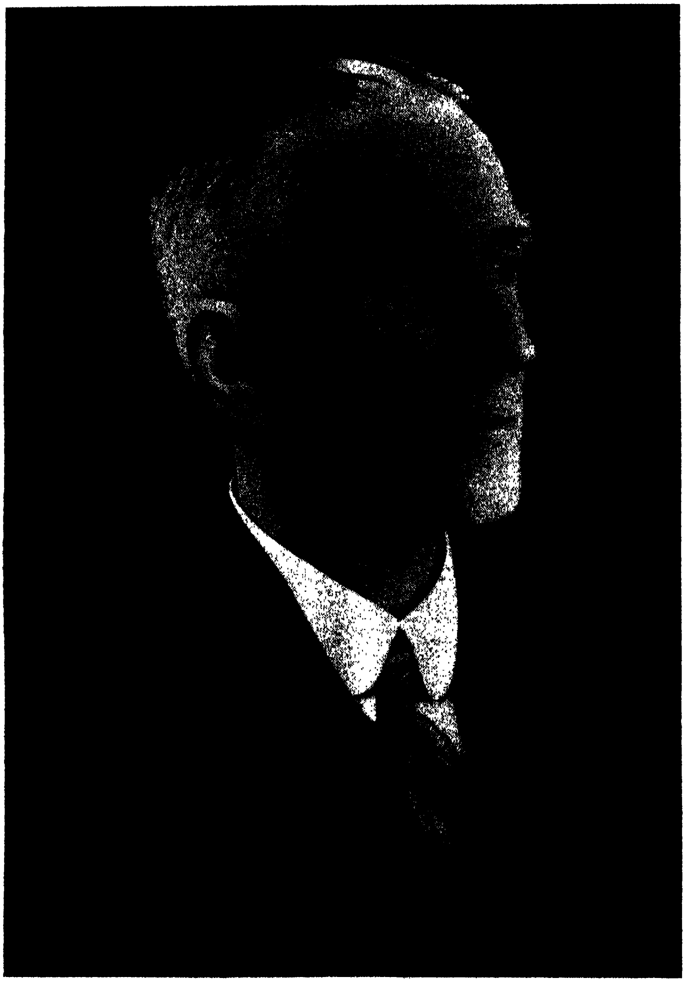

Plate 10.

Mr. R. P. M. SHORT.

Immediate Past Under Secretary, Department of Agriculture and Stock.

THE IMMEDIATE PAST UNDER SECRETARY.

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Mr. Richard P. M. Short.

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MR. RICHARD P. M. SHORT retired from the office of Under Secretary on 30th June after 49 years continuous service in the Department of Agriculture and Stock.

Mr. Short entered the Queensland Public Service as a junior in the Stock Branch in 1898 and advanced to senior grades to become eventually head of one of the most important of State Departments. He remained with the Stock Branch until 1924, when he held the positions of Senior Clerk and Registrar of Brands. He also was secretary of the Cattle Tick Committee, which consisted of representatives of the Council for Scientific and Industrial Research and of the Queensland and New South Wales Governments. While in the Stock Branch he edited "The Drovers' Guide," a former departmental publication.

In 1925, Mr. Short was appointed Senior Clerk in the Department and continued in that position until his appointment as Chief Clerk in July, 1933. In February, 1939, he was appointed Acting Under Secretary and subsequently Under Secretary.

Mr. Short also was Chairman of the Agricultural Bank Board; member of the Standing Committee of the Australian Agricultural Council; member of the State Committee of the Council for Scientific and Industrial Research; and member of the Faculty of Agriculture within the University of Queensland. He also was a trustee of parks and gardens under the control of the Department and of certain properties resumed for experimental purposes.

In his younger days, Mr. Short was associated with many sporting activities, especially cricket and tennis. He was honorary secretary of the Toombul Electorate Cricket Club in its heyday. The bowling green now claims much of his leisure as a member of the Booroodabin Club, of which he has been one of the champion rink.

Mr. Short has retired to well earned leisure with the good will and esteem of his departmental colleagues which was warmly expressed by the Minister, Hon. H. H. Collins, and a former Minister, Hon. T. L. Williams, and senior officers of the Department at a social gathering to mark the occasion of his retirement.

Irrigated Lucerne in Queensland.

W. G. FERGUSON, Adviser in Agriculture.

IRRIGATION of lucerne in Queensland is restricted mainly to the south-east corner of the State where the conditions of temperature, rainfall distribution, soil, supplies of irrigation water and proximity to markets are most favourable. Water is obtained from wells, running creeks, dams behind weirs and, in some places, from large lagoons. It is usually applied through spray lines, and delivery nozzles of the perforated dome and the butterfly types are mostly preferred. Electrical power is widely used for pumping, although tractors and stationary engines are still employed on some farms.

Soils.

Since lucerne is a deep-rooting plant and it is essential that irrigation land be well drained, the natural choice of soils is the deep, rich, porous alluvials. Clays should be avoided, not only because of their poor permeability to water, but also because of the obstacles they present to effective working. Clay loams, particularly when well supplied with lime, are desirable as they possess self-mulching properties and are usually well-drained. The use of very sandy soils is not recommended, because of their low water-holding capacity.

Preparation of the Land.

A fine well-worked seed bed free from weeds is of primary importance, for lucerne is slow-growing when young and weeds may retard growth still further or even seriously reduce the stand

Autumn is the normal planting season and the initial ploughing, 6 inches-7 inches deep, should be done several months earlier in order to conserve moisture and establish a good tilth. Where nut grass, a serious pest of irrigated lucerne, has to be controlled, a much longer working of the ground is required, and the practice of first ploughing ten to twelve months before sowing has much to commend it. By this method, the stand of nut grass can be greatly reduced and may even be almost eliminated by vigorous working during the dry winter and spring months.

Oats and potatoes are suitable crops to precede lucerne, for they reduce weed growth and leave the land friable and mellow. Maize also may be used, although the drawback with this crop is that some difficulty may be experienced with unrotted stalks. The temptation then is to use the fire stick, thus destroying a source of much-needed humus.

At least two ploughings should be given, the final one being slightly shallower than the first. When ploughing, it is advisable to work in lands rather than by the round and round method, as the latter tends to leave a depression in which irrigation or rain water will lodge. Even if the lucerne in such depressions is not scalded, its vitality and productivity will be reduced. Very little attention has been given to grading the land in the past, but consideration should be given to the irregularities in levels which are found in most fields. After the first ploughing, the land should be left fallow to conserve moisture and after fallowing worked down with disc or tine implements. The land should be ploughed again by March and worked to a fairly shallow seed bed and fine surface mulch with harrows.

Sowing.

April is generally considered the most favourable time for sowing, for during the first quarter of the year adequate moisture can be conserved in the soil and many weeds can be eliminated. After April, weed growth is on the wane and competition with the slower growing lucerne is reduced. Growth above ground during winter is slow, but the framework of the extensive root system, so essential in the life of the stand and the weight of cuttings, is laid down. Plantings are sometimes made in the spring, either through design or circumstances, but at this time a watering to germinate the seed is generally necessary. Spring plantings not only have additional weed growth to contend with, but emphasis is on the growth of the above-ground portion of the plant to the detriment of the root system.

The amount of seed sown per acre depends on the size of the seed, its impurities and the method of sowing. Seven to 9 lb. per acre are sufficient when using a seed drill, 9 to 11 lb. per acre if broadcasting by machine and, if sownig by hand, the amount may be increased to 13 lb. per acre, to avoid a patchy strike. On irrigated lands up to 18 lb. per acre are sometimes sown where nut grass is fairly thick, but this practice results in an overcrowding of plants, light stooling, feathery stemmed small-leaved hay and a short-lived stand.

Methods of sowing depend on the implements available and the moisture content of the soil. Placing the seed in the ground is done either by seed drill, by one of several types of broadcasting machines, or by hand The drill has the advantage of placing the seed at a desirable depth of approximately 1 in. and actually in contact with the soil moisture which is necessary for germination. Compared with other methods, it uses less seed per acre to obtain the same plant population. When broadcasting, the land is first harrowed and the seed sown either by machine or by hand. It is advisable to sow half the seed in one direction and the other half at right angles, thus tending to eliminate an uneven strike. After sowing, the harrows are used again to cover the seed and followed by a levelling drag board to give a firm smooth surface.

If irrigation is necessary to ensure germination, the water is applied immediately after sowing and levelling. However, this first irrigation should be light for though the surface may be dry, moisture should be present in the sub-soil. It is essential at this irrigation to watch for any change of wind which may cause dry patches or strips and subsequently a patchy germination.

It is advantageous to have two spray lines laid out in different sections of the field, so that, after one line has completed the desired watering, the second can be connected to the main and the ground around the first allowed to firm before the pipes are shifted to a new position.

The beneficial influence of nitrogen-forming root nodules on cultivated legumes is now well known among farmers. Lucerne is no different from other legumes in this respect and will surely benefit from the presence of the nodule-forming organism. The most certain method of ensuring that the desirable nodules are present is by sowing suitably inoculated seed. Many tests in Australia and overseas have proved that inoculated seed comes away more quickly than untreated seed, thus gaining an initial advantage against any weed growth which may occur in the newly-planted lucerne field. Sufficient inoculum to treat whatever quantity of lucerne seed is intended for sowing may be obtained for a nominal sum from the Under Secretary, Department of Agriculture and Stock, Brisbane.

Weed Control in the First Year.

The seedling stand normally requires very little attention, although at times cutworms may destroy patches within the field and these patches must be resown once the cutworms have been dealt with by poison baits or dusts.

Weed growth should be light if seed bed preparation has been thorough and can be handled by hoeing, if the area is small, or by mowing if the area is large. Two mowings will generally suffice, if winter weeds become established; and they must be made, even though the lucerne is not ready for cutting. When making a premature cutting the cutter bar should be raised so that weed seed heads are removed without damage to the young stand. It is of particular importance to note that the first cut for hay should not be made until new shoots are breaking at the crown.

Deep renovation is unnecessary during the first twelve months, a light harrowing being all that is needed to aerate the soil and retain the surface mulch.

Irrigation.

The yield of hay is directly related to the volume of water available to the plant, so that sparing or infrequent waterings will result in diminished yield or retarded growth.

The water requirements of the crop vary considerably with the season. In the summer when surface evaporation and transpiration are high, the water requirements of the crop will be high. In the winter when growth is slower and the evaporation from the soil surface is not excessive, the water needs of the stand will be noticeably reduced. Normal rainfall during spring and early summer months is not sufficient for a routine cutting every four weeks. During these months when weed growth is held in check and pests are negligible, irrigation obviates those water shortages so destructive to a lucerne stand and enables the farmer to maintain production at a high level.

The first watering, whether for the new or established stand, is given in late July or early August. This irrigation is important in that it should be sufficient to create a storage of sub-soil moisure which will allow a quick and unchecked growth for the first spring cut.

The amount applied and time of application for subsequent irrigations will, of course, be dependent on weather and soil type, and is a matter for the individual farmer to determine for himself. One irrigation of 3 to 4 inches made immediately after the crop is cut is adequate for good hay yields. A heavier application may induce waterlogging, while a lighter watering might necessitate a second before the crop is cut. During drought, two irrigations per cutting or three per two cuttings may be necessary. When two waterings per cutting are needed, the second is usually a lighter one. By January, irrigation has become incidental to rainfall and weed growths, particularly some of the grasses, are the main problem. Applications of water again become necessary from March to May, when, although cuttings become progressively lighter and take longer to mature, excellent hay, free from weeds may be cured under stable weather conditions.

Although the retention of sub-soil moisture is highly desirable in order that no excess soil cracking or major root death occur, it is wise to withhold irrigation during mid-winter and commence replenishing the sub-soil moisture in late July. This practice permits the soil to dry out, sweeten and aerate naturally. Watering continuously throughout winter causes a sodden and at times frozen surface, neither of which is beneficial to the lucerne.

Haymaking.

The indicators of good quality lucerne hay of high food value are a green colour, a crisp feel, a high percentage of foliage and freedom from weeds and grass. Quality is mainly a product of the methods used in haymaking and it is essential that all phases receive strict attention if a prime lucerne hay is to result.

The best quality hay is obtained by cutting just before the base buds break at the crown. However, continuous cutting at this stage reduces the yield and vigour of the stand; therefore, the best time to cut is when the base buds have shot or when the field is one-tenth to one-fifth in bloom. If cutting is delayed too long, however, a high leaf drop and a coarsening and hardening of the stem occurs.

This is caused by the transfer of nutrients from the stems and leaves to the upper portions of the plant. If the plants become stiff and yellow because of waterlogging of the soil or of insect attack, the crop should be cut, irrespective of the condition of the basal shoots or flowers.

The mowing of the crop should be commenced just as soon as the dew has dried from the leaves and stems. When the cutting commences, the farmer should aim to take off only as much as he can handle with the machinery and labour available. This means that he will not be forced to leave hay lying in the field in the hope that fine weather will continue. The latter practice often results in a total loss of the hay or at best an inferior product.

Treatment after mowing should be directed towards a reduction of the moisture content by 75 per cent. and the retention of leaf colour and aroma.

The first rapid reduction of moisture is achieved in the swathe where the hay wilts quickly. It should not be allowed to bleach or become brittle. The average period in the swathe on a hot sunny day is a few hours, after which the hay is raked into windrows for easier

cocking. The dump rake is most commonly used in Queensland, although the side-delivery rake which makes a better windrow is becoming more popular. Lucerne hay may be air-dried and partially cured in the windrow with the side-delivery rake, but for a prime quality hay curing should be continued in the shed or stack.

It is best to fork into tall and fairly narrow cocks which will shed rain and allow the hay to sweat and cure with maximum retention of leaf and colour. The hay should not be cocked unless it is sufficiently dry and free from rain or dew. If wet hay is cocked, extra labour will be involved in opening the cock for aeration and further drying. Should the cock become wet at a later stage, it may be necessary to open, aerate and recock. The hay is ready for carting off the field and stacking when it is crisply moist and no free moisture exudes when several stems are combined and twisted in the hands.

The usual sequence is to stack the hay and then bale or chaff when time allows or markets dictate. Stacking in the hay shed is by far the best means of giving added curing and protection from the weather. Stacks made in the open should be covered with galvanised iron.

Renovation.

Renovation is cultivation of the field carrying a growing crop. It is an operation considered essential for other crops, but practised far too infrequently with lucerne. Renovation and irrigation must be inseparable if efficiency, low costs and high yields are to be attained. They should be applied in that order after the crop has been cut and the hay removed.

Any renovation attempted during the first twelve months of the life of the stand should be in the nature of a light harrowing. Heavier working causes bruising and direct injury to the young tap root. Once past this stage, renovation, by either stiff shank or stiff tine implements fitted with a renovating tooth, or better still a specially constructed renovator, can be effected with excellent results.

The depth of the first renovation should be approximately one inch. The soil is loosened and aerated, surface rooting grasses are torn out, weeds are killed, and the soil left in a receptive state to absorb moisture. As the stand becomes older renovations become progressively deeper, until in a four-year-old stand a three-inch-deep renovation is necessary to open up a soil which has been compacted by farm implements and water.

Three renovations a year are a minimum requirement for an established stand. These consist of shallow workings in November-December and February-March to remove grass and weeds and loosen up the soil before and after the heavy mid-summer rains, and a deeper renovation in July-August to prepare for the spring and early summer cuttings. It is advisable at the time of the main renovation to obtain complete cultivation by a cross working.

Renovation naturally leaves the land slightly rough and cloddy and after a late summer working dead and dying grass clumps are fairly prevalent. The procedure then is to allow several days to elapse and then remove the grass and reduce the land to a level surface. Light harrowing and rolling followed by normal watering will dissolve the clods but should the harrows fail to remove the grass a hay rake may be used.

Disc implements are sometimes used for renovation, but they are not recommended. The cutting action of the disc splits the crown of the plants and cuts the roots, thus facilitating the entrance of disease organisms. Even though diseases do not develop, the plant injury caused is detrimental to the life and yield of the stand.

Lucerne in the Rotation.

The average life of an irrigated stand is five to six years, though eight to ten years is not uncommon. The incidence of diseases, renovation, time of cutting, frequency and amount of water and crop rotation all have an influence on the life of the stand—the crop rotation being a very important factor. Once a lucerne stand is ploughed out, it is wise to sow other crops for a period of five years before resowing to lucerne. At least once during those five years the humus content should be replenished by the ploughing in of green crops, sown especially for the purpose, because irrigation tends to accelerate the decline of soil fertility.

MINERAL FERTILIZERS.

The following statement on a lately much debated question is taken from a recent issue of *Soil Conservation*, official organ of the Soil Conservation Service of the United States Department of Agriculture:—

Dr. Emil Truog, professor of soils at the University of Wisconsin, evaluated the importance of organic matter in the soil at the Fifth Annual Conference on Conservation, Nutrition, and Health, at Ohio University, recently. Dr. Truog said:

"Much ado is being made to-day about the great importance of soil organic matter in relation to soil fertility, soil conservation, and crops of satisfactory nutritive value. This, in part, is as it should be, because soil organic matter is of tremendous importance. It facilitates the intake of water and thus reduces run-off and erosion. It also favours workability or ease of cultivation, aeration, and drainage. Fresh organic matter contains all of the elements needed for plant growth, which, as decomposition proceeds, are released in forms suitable for new plant growth.

"However, to say that chemical fertilizers such as superphosphate and muriate of potash should not be used to make up inevitable deficiencies of nutrient elements that cannot be supplied through the use of organic matter is just pure 'bunkum.' Absolutely no evidence exists to the effect that the judicious use of mineral fertilizer is at all injurious to soils, or tends to produce crops which are unsatisfactory as feed for animals or food for man. In fact, evidence, almost without end, now exists showing clearly that the use of mineral fertilizers on depleted soils promotes the growth of crops which have superior nutritive values.

"The fertility and organic matter content of gardens and other small areas may be maintained through the use of animal manure and composts. This use of composts is both feasible and commendable. However, when large areas are involved, as is the case in general farming, this practice is not feasible because of the impossibility of preparing and applying the enormous amounts of compost which would be needed. Fortunately, in general farming it is both convenient and profitable to follow a rotation of crops which provides the necessary organic matter in the form of crop residues (stubble, stalks, and roots) and animal manure produced in the feeding of crops. All that is required to make this system supply the needed organic matter is the proper use of lime, phosphate, and potash.

"It is sometimes said that 'nitrogen spells organic matter.' This means that liberal supplies of nitrogen promote such luxuriant growth that large additions of organic matter naturally follow. In the atmosphere over every acre of land, there exist in round numbers 35,000 tons of gaseous nitrogen. If these 35,000 tons of nitrogen were all transformed to a fixed (non-gaseous) form such as ammonium nitrate, the product would have a commercial value as fertilizer of over 5,000,000 dollars. How can the farmer draw upon this tremendous and inexhaustible supply of nitrogen? It is by growing legumes, which, when properly inoculated and fertilized, have the power of fixing atmospheric nitrogen which they can then use for the synthesis of proteins. Non-legumes, regardless of how grown, cannot utilise atmospheric nitrogen. They are dependent for nitrogen on that fixed by the legumes, or supplies in manure and commercial fertilizers."

Plate 11.

FARM WATER CONSERVATION.—A Scene on the Minden Range, West Moreton, Queensland.

[*Photo.: Queensland Country Life.*

PLANT PROTECTION

Developments in Codling Moth Control.

N. E. H. CALDWELL, Horticulturalist.*

A FURTHER experiment in the control of codling moth was carried out in the Stanthorpe district during the 1946-1947 season, and the information obtained on several aspects of the problem may influence growers' spraying programme next season. This short account should, therefore, prove of interest.

Outline of Experiment.

The experiment was laid down in a block of Granny Smith apples. All trees received a calyx spray made up of lead arsenate 3 lb., hydrated lime 1½ lb., and water 100 galls. Eight cover sprays were applied, the timing being in accordance with the notices issued for the district by the Department of Agriculture and Stock. The following were the cover spray treatments:—

A. Lead arsenate 3 lb., white oil 2½ pints, water 100 galls.

B. Lead arsenate 3 lb., hydrated lime 1½ lb., white oil 2½ pints; water 100 galls.

C. Lead arsenate 3 lb., zinc sulphate 1 lb., white oil 2½ pints, water 100 galls.

D. Lead arsenate 3 lb., zinc sulphate 1 lb., hydrated lime 2 lb., white oil 2½ pints, water 100 galls.

E. Zinc fluoarsenate 3 lb., white oil 2½ pints, water 100 galls.

F. D.D.T. 0.1 per cent.

G. D.D.T. 0.05 per cent.

H. D.D.T. 0.05 per cent., white oil 1 per cent.

I. D.D.T. 0.1 per cent., replaced by white oil 1-60 after end of December.

J. D.D.T. 0.1 per cent., alternating with white oil 1-60 in successive spray periods.

K. White oil 1-60.

L. Control, untreated.

Codling moth incidence was severe throughout the Granite Belt, and the orchard in which the experiment was located suffered at least average losses for the season.

Weather conditions were abnormally dry for the first part of the season, but wetter than average for the remainder.

* Formerly Entomologist, Science Branch.

Lead Arsenate Sprays.

The standard lead arsenate spray (lead arsenate 3 lb., white oil 2½ pints, water 100 galls.) gave very disappointing results. More than 40 per cent. of the apples were attacked and almost 10 per cent. of the crop was classed as "wormy." Extensive leaf burn, which normally follows the use of lead arsenate, appeared on the experimental trees receiving this spray.

The variations of the standard spray used were introduced in an attempt to lessen leaf burn. Hydrated lime, already quite widely used because of its alleged "safening" properties, did not influence either codling moth control or foliage injury under the conditions of the experiment, when added in quantities equal to half that of the lead arsenate. Zinc sulphate added to the lead arsenate spray at the rate of 1 lb. per 100 gallons improved moth control but caused increased foliage burn, some fruit blemishing and a reduction in fruit size. However, when hydrated lime and zinc sulphate were both added to the standard spray better codling moth control was obtained, leaf burn was almost eliminated and a general improvement in tree health resulted.

The lead arsenate-hydrated lime-zinc sulphate combination, while promising in some respects, leaves a very heavy residue on the fruit. Under present conditions in Queensland this must be considered a serious drawback. It is possible that modifications of the formula to reduce the total solids in the spray mixture may overcome this disadvantage to some extent, but further investigation along these lines is necessary.

Zinc Fluoarsenate.

Zinc fluoarsenate is a comparatively new insecticide which has been favourably reported on in some overseas countries. According to overseas sources, this material is said to be as efficient as lead arsenate for the control of codling moth, and less injurious to the trees.

Small supplies were recently made available and in the experiment just completed the insecticide was tested for the first time in this State. When used at the same strength as lead arsenate, the degree of codling moth control obtained was about the same as with lead arsenate and foliage injury was just as severe. It is concluded that zinc fluoarsenate is unlikely to play any part in Queensland's codling moth control programme, particularly in view of developments in the use of D.D.T., which will be discussed in subsequent paragraphs.

D.D.T. Sprays.

Promising results were obtained with D.D.T. in the 1945-46 experiment and success has been reported elsewhere with this insecticide. Hence a considerable part of this season's experiment was concerned with D.D.T.

An 0.1 per cent. spray, prepared from a mayonnaise-type emulsion, gave outstanding control of codling moth. The total fruit attacked was less than 10 per cent. and "wormy" apples comprised less than 1 per cent. of the crop. When the D.D.T. strength was reduced to 0.05 per cent., control was less efficient but still tolerably good.

D.D.T., particularly at the 0.1 per cent. strength, proved considerably more effective than any of the lead arsenate sprays in reducing infestation. In addition to the low percentage of "wormy" apples, it was noted that blemishes on "stung" fruit from trees sprayed with either concentration of D.D.T. were usually much more superficial than in the case of the arsenical-sprayed trees. Larvae are apparently affected more quickly by D.D.T. than by lead arsenate and thus do not penetrate so far into the fruit before finally succumbing to the toxic effects of the insecticide.

D.D.T. caused no foliage injury and the fruit, being well sized and free from visible residues, had a very pleasing appearance.

Contrary to last season's experience, woolly aphid populations did not reach serious levels, though there was a slight build-up in one or two trees. Mites, on the other hand, again increased rapidly on all trees treated with D.D.T. alone and caused considerable leaf mottling.

In anticipation of woolly aphid and mite increases, the three variations of the D.D.T. schedule involving white oil were introduced into the experiment. All gave a degree of codling moth control comparable with that obtained with 0.05 per cent. D.D.T. When white oil, at a concentration of 1 gall. to 100 galls. of spray, was added to 0.05 per cent. D.D.T. or, at a concentration of 1 gall. to 60 galls. of water, was used alternately with 0.1 per cent. D.D.T., mite damage was negligible. However, when white oil, 1–60, replaced 0.1 per cent. D.D.T. after the end of December, mite injury was about the same as when D.D.T. alone was used throughout.

All D.D.T.-white oil schedules caused moderate leaf burn. Where white oil at the 1–60 strength was included there was some reduction in fruit size.

Oil Sprays.

Codling moth control with white oil, 1–60, was indifferent. The percentage of fruit attacked was about the same as with the best lead arsenate spray but it was noted that the proportion of "wormy" apples was much higher. Some leaf burn occurred and there was a marked reduction in fruit size. The last-named effect makes the use of white oil at this concentration unwise, except perhaps occasionally in exceptional circumstances.

Next Season's Control Measures.

Orchard Hygiene: The standard of orchard hygiene in the Granite Belt has, generally speaking, deteriorated in the last few years. Owing to the severe moth activity last season, the number of over-wintering larvae is bound to be large. Growers should therefore pay particular attention to orchard hygiene this winter so as to reduce the spring brood of moths as much as possible. There should be a thorough clean-up of the packing shed and its equipment, followed by a liberal application of waste sump oil or an oil emulsion spray to inaccessible cracks and crevices. Trees should be examined carefully for larvae during pruning. Finally, all rubbish, both in the orchard and in the packing shed, in which larvae may shelter, should be gathered up and burnt.

Winter Sprays: As a first step in dealing with the problem of increased mite populations following the use of D.D.T., a special effort should be made to apply a winter oil spray. This should take the form of a red oil spray at a strength of 1 in 20 in late July, or, alternately, pale oil-lime sulphur, 1-1-20, towards the end of August.

Calyx Spray: The standard lead arsenate calyx spray (lead arsenate 3 lb., white oil 2½ pints, water 100 galls.) should be retained. So far no experimental work has been carried out in Queensland with a view to substituting D.D.T. for lead arsenate at this stage.

Poisoning of bees by the injudicious use of lead arsenate has attracted notice again in recent years. Careful attention should be given to the correct timing of the calyx spray. This should be applied when the bulk of the blossoms have shed their petals but before the calyx cups have become enclosed by the upturning sepals.

The question of D.D.T. poisoning of bees requires further investigation but the indications are that this insecticide is not likely to prove as dangerous as was at first thought.

Cover Sprays: If D.D.T. is used instead of lead arsenate for the cover sprays, reduced losses from codling moth can be expected. The strength advised is 0.1 per cent. actual D.D.T. However, the following contingencies must be kept in mind:—

1. If mites increase seriously—and this is liable to happen in the spring—some special attempt to control them will be necessary. The addition of wettable sulphur at the rate of 1–2 lb. to 100 galls. of D.D.T. spray has given promising results elsewhere and should be worth trying. Alternatively, an oil spray, 1-60, may be substituted for one of the D.D.T. applications. If white oil-nicotine sulphate is used to control woolly aphid it will also be of some value in reducing mite populations.
2. If woolly aphids, shows signs of getting out of hand, immediate measures should be taken to cope with them. The most obvious remedy would be to replace one or more of the D.D.T. sprays with the standard white oil-nicotine sulphate spray (white oil 2½ pints, nicotine sulphate 1¼ pints, water 100 galls.) which is effective against aphids and, before the advent of D.D.T., was perhaps the most effective spray available for codling moth control. The direct mixing of D.D.T. with nicotine sulphate is not recommended.
3. Because of the risk of undesirably heavy residues accumulating on the fruit, D.D.T. treatments should cease three to four weeks before harvesting. A substitute spray for one or two applications would thus be necessary, particularly on early and mid-season varieties, and white oil-nicotine sulphate is again suggested.

Timing of Cover Sprays: There is no evidence to suggest that the use of D.D.T. will permit the number of cover sprays to be reduced. Hence applications should be made as usual in accordance with the spray notices issued by the Department of Agriculture and Stock.

Sheep Worm Control.

RESULTS of recent research into the control of internal parasites of sheep were described and demonstrated in the course of a series of eight field days for wool growers in the central Highlands and the South-east during June. The field days were arranged by the Department of Agriculture and Stock in co-operation with local branches of the United Graziers' Association; and were conducted by Mr. H. McL. Gordon, B.V.Sc., a senior research officer from the C.S.I.R.'s McMaster Animal Health Laboratory in Sydney, assisted by veterinary officers of the Department.

In 1942 Mr. Gordon initiated a series of surveys designed to show the seasonal variations in the worm burdens carried by sheep in Queensland. Attention was focused also on the distribution and types of worms likely to cause greatest economic loss in this State. The keenness of a number of woolgrowers has been largely responsible for the success of the surveys and their co-operation with the Department and the C.S.I.R. is appreciated.

The recent field days were conducted at Mr. L. J. O. McCosker's "Codenwarra," Emerald; Messrs. Brown Bros. "Valencia," Clermont; the Show Grounds, Jericho, Barcaldine, Roma, and St. George; at Mr. A. Treweeke's "Umbercollie," Goondiwindi and Mr. W. Raff's "Waraghi," Karara. The main object was to explain the results so far obtained from the surveys and to point out to pastoralists and farmers how this information could be used in preventing outbreaks of worm infestation.

Mr. Gordon stated that the control of the barber's pole, hair and nodule worms in Queensland depended on a programme based on:—

(1) *Following a Seasonal Plan.*—By making use of the results of the worm surveys it is possible to carry out "preventive drenching" at times designed to forestall the worms. This means the administration of phenothiazine in May and August.

(2) *Drenching Plus Management.*—Correct management includes the use of the right drench at the right time, plus some system of rotational grazing and spelling, thereby completing a double attack on the parasites.

(3) *Drenching By the Weather.*—Recognizing the necessity of moisture for the eggs and larvae on the ground, it is important to drench three weeks after rain falls. This means any worms picked up after the rain are killed before they have had time to reach maturity and recontaminate the pastures.

(4) *Watch the Grazing Habits of the Sheep.*—When sheep overcrowd special areas of pasture such as hollows, water-courses, billabongs and gilgais or along bore drains, a heavy contamination with worm eggs will occur. In these places the eggs are likely to complete development and the larvae will, most probably, be consumed by grazing sheep. When this local overcrowding is seen it is an indication for some measures to check the worms, i.e. drenching or a move to a spelled paddock or both.

(5) *Work to a Plan.*—To control worms it is necessary to prepare a plan based on general station management (i.e., in relation to shearing, lambing and other activities); on weather conditions; and on the information available from the Department of Agriculture and Stock. (A new pamphlet, *Control of Worm Parasites of Sheep*, will be ready soon.)

(6) *Ask the Department of Agriculture and Stock.*—Consult your district veterinary officer, inspector of stock or sheep and wool adviser in making your plans. These officers have the latest information. If your plan breaks down, ask why?

About 400 woolgrowers attended the demonstrations. Keen discussion developed at question time after each lecture and the postmortem examinations made of the sheep submitted were watched with intense interest.

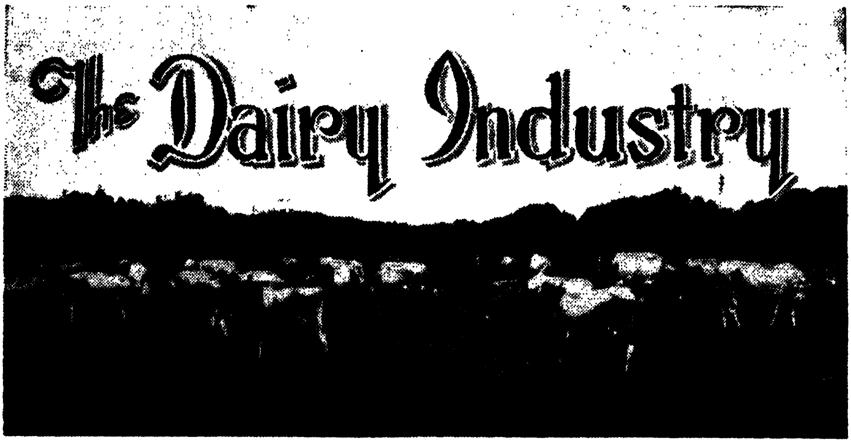
TAR STAINS IN WOOL CAUSE TROUBLE.

In addition to their other considerable difficulties British manufacturers and dyers are having trouble with tar brands in wool. Some of their complaints have come under the notice of the International Wool Secretariat, London. Last month a firm of English dyers reported to a Bradford manufacturer that tar stains were occurring to a marked degree in some of the Velour cloths supplied and were causing a slowing down of production and a certain amount of ill-feeling.

The report added: "When picked and hand-cleaned it is almost invariably necessary to send the piece back to re-scour, which of course necessitates re-dyeing and re-examining and so forth. There would appear also to be a considerable variation in the density of the fault, resulting in some cases in the time taken for hand-cleaning to be as much as two hours or more for a single piece.

"It will be readily understood from the foregoing that the dyeing of this material into light shades is very difficult, to say the least, and that it is at times impossible to get pieces into saleable condition in the shade ordered."

Acknowledging the representations made, the Bradford firm expressed sympathy with the firm of dyers and pointed out that until the wool-grower desisted from using tar or raddle to mark his sheep there was always a chance that some of it would get into the noils. The only alternative was to use carbonized and depitched noils which would add about 6d. per lb. to the price of the yarn. Even then, the letter said, they were not sure that the resultant cloth would handle quite as well as the present quality.



Milk Quality Tests.

E. B. RICE, Division of Dairying.

THE standard method of assessing bacterial numbers in milk is the plate count. It requires special laboratory facilities, can only be carried out by trained laboratory workers, does not give a result in under 48 hours, and so is unsuitable for factory use. In milk quality control schemes tests are needed which can be carried out by factory staffs in an ordinary factory test room, and give rapid results.

This paper is intended to describe tests which are applied in milk quality control work in Queensland.

These tests may be used at factories to enable an appraisal of the suitability of milk of individual producers for the liquid milk market or for cheesemaking. They may also be used for advisory purposes to reflect the care taken in production and handling, to detect the inclusion of abnormal milk such as that from mastitis cows, cows late in lactation, "soft curd" milk, or colostrum, and to indicate roughly the nature of the organisms and hence the kind of contamination. Practical experience acquired by dairy advisory officers from the tests will enable a rather accurate prediction of the cause of contamination, and on farm visits help to locate it rapidly and to recommend remedial measures. Where farmers themselves deliver milk to a factory the tests may be demonstrated to them in order to afford visual evidence of the undesirable changes which take place in milk through improper production practices. The simple factory tests do not give actual bacterial counts; this is really no disadvantage, for the main thing is to know the general conditions of production, as shown by the types of bacteria, and their effect on the product, which in practice is really what matters.

Milk quality tests should always be used in conjunction with the regular inspection of milk by smell and taste which must always be carried out by a qualified milk grader on the receiving platform of the factory. No amount of description and no scientific test at present known can replace the practical knowledge gained by long experience of grading milk and dairy products, and it is therefore essential to the making of a good grader that he should spend as long a period as possible training under the instruction of an experienced man.

The Methylene Blue Test.

The methylene blue test has been used for many years in Scandinavian countries and in America for giving a measure of the numbers of bacteria and their activity in milk, and for the grading of milk. In 1937 it was adopted in England to replace the plate count as the official method for the testing of higher grades of milk sold for human consumption, known as tuberculin-tested and accredited milk. It is now also used officially in England as a test for pasteurised milk.

Advantages of Methylene Blue Test.—The methylene blue test does not require special laboratory facilities nor technical training beyond that of a skilled factory operative, can be carried out under factory conditions, and takes not more than a few hours to obtain a result. It gives further information about the quality of milk than is possible by judging the aroma and palatability of the milk.

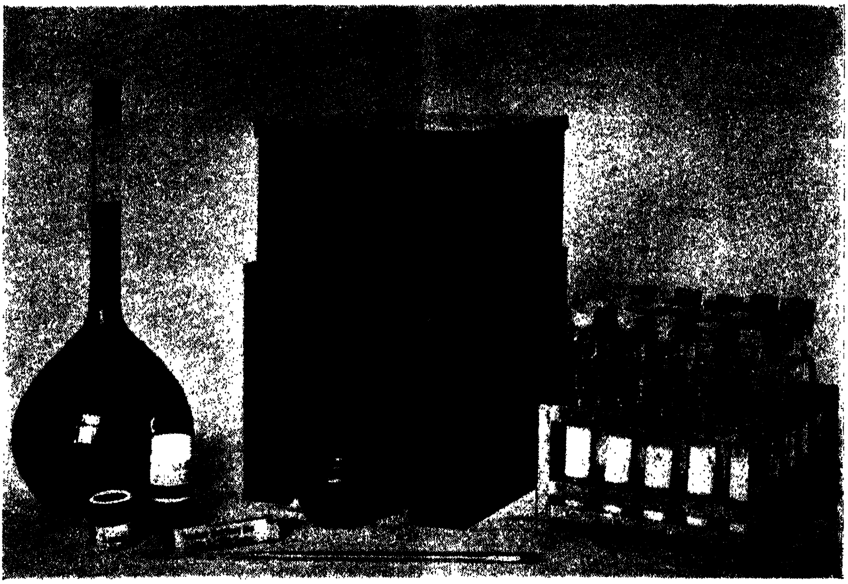


Plate 12.

APPARATUS FOR CARRYING OUT THE METHYLENE BLUE REDUCTION TEST IN THE FACTORY, USING A KEROSENE LAMP.

Application of Test.—It may be used as a test to classify the grades of milk for the market milk industry or cheese manufacture, and to fix grades for which differential prices are paid. Regular examinations of milk of individual suppliers may be made for the purpose of deciding suppliers of milk of unsatisfactory quality, and directing the attention of advisory officers to farmers most needing their services.

Regularity of methylene blue (or resazurin) testing of milk supplies received at factories is an integral part of any milk quality control scheme. Each supplier's milk should be tested weekly, if possible, but in any case not less frequently than fortnightly. Good producers appreciate the check thus kept on their shed methods.

Principle of Test.—The methylene blue test depends on the ability of bacteria to decolourise a dilute solution of methylene blue added to milk. The bacteria absorb the dissolved oxygen in the milk at a rate roughly proportional to their number. The end point, noted by complete decolourisation of the dye, appears when the oxygen has been entirely used up. The rate of bacterial activity is altered by lowering or by raising the temperature, so that a standard temperature has been fixed at 37 deg. C., and the test is conducted in the dark as the methylene blue is affected by light.

Apparatus Required.—1. A water bath, fitted with a lid and test tube racks, capable of maintaining a constant temperature of 37 deg. C. (98 deg. F.).

2. An accurate thermometer.

3. Test tubes (6 in. x $\frac{5}{8}$ in.) with a mark at the 10 ml. level and rubber corks to fit the test tubes.

4. Standard methylene blue tablets.

5. A 1-ml. pipette for measuring methylene blue solution, or a 10-ml. pipette graduated in millilitres.

6. An 800-ml. measuring flask for use in making up the methylene blue solution and a rubber stopper to fit.

Cleaning Glassware.—Measuring flask, test tubes, corks, and pipette may be sterilised in a steam chest or by boiling in water for five to ten minutes after first being thoroughly washed in a warm soda solution. The tubes should be placed upright in their rack and filled to the brim with clean water, before immersion for boiling. A sheet of aluminium, secured by screws or wire to the rack, and placed in position covering the mouths of the tubes before sterilising, will enable them to be inverted easily for draining and will protect them from contamination until ready for use. The corks may be tied in a piece of clean muslin. The apparatus should be sterilised immediately before use, and allowed to cool and drain dry.

Making up the Standard Solution.—Distilled or tank water, for making up the standard solution, may be sterilised by boiling for five to ten minutes and allowing to cool in the same vessel. It is essential that standard methylene blue tablets be used in carrying out the test. These are prepared by certain firms only and are sold in packets containing twenty tablets (sufficient for 16,000 tests). Names of firms supplying apparatus and standard methylene blue tablets will be supplied on application to the Department of Agriculture and Stock, Brisbane.

Dissolve one tablet in about 200 ml. of cold sterile distilled water in the 800 ml. measuring flask, by shaking, then fill up to the mark.

This stock solution, when corked and stored in the dark, will keep for periods up to two months. It should not be used after this.

Regulation of Water Bath.—The water bath should be filled with water at about 37 deg. C. some time before commencing the tests. The temperature should be kept steady at 37 deg. C. during the test.

The level of water outside should be above or equal to that of the milk inside the tubes.

Sampling.—As with all bacteriological samples, special precautions must be taken to exclude contamination. If sample bottles and corks or screw-tops are used, they must be sterilised by heat prior to use. Care must then be taken not to handle the mouth of the bottle or to touch any part of the cork other than the top ¼ inch, and the bottles must not be opened until just before filling and must be closed immediately afterwards.

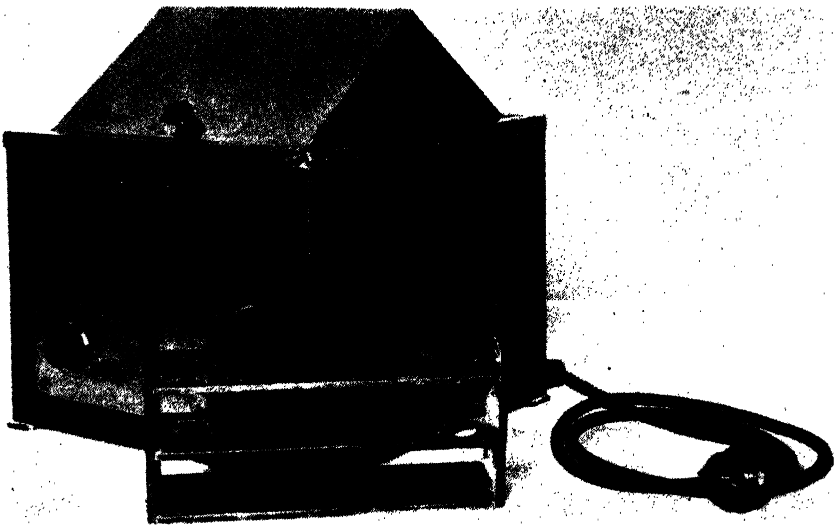


Plate 13.

ELECTRICALLY HEATED AND CONTROLLED LABORATORY WATER-BATH, SHOWING ONE TEST-TUBE RACK.

A composite sample is taken to include a proportional amount of milk from each can received. This may be done in one of several ways.

(*a*) A weighing-vat sample is easy to take, representative and as reliable as a sample taken from the cans. Use a small dipper—a 10 ml. stainless steel dipper preferably—to dip the sample from the vat.

(*b*) Stir the contents of the cans with a plunger stirrer and take the sample with a small dipper (preferably a 10 ml. stainless steel dipper). This makes it possible to pour the milk direct into the sterile test tube.

(*c*) By using a cream sampler of the long handled saucer type, stirring and sampling may be carried out in one operation and the milk placed in a sterile bottle.

(*d*) If the Wisconsin curd test is also to be carried out, pour 10 ml. of milk from the curd test jars into the test tubes to be used for the methylene blue tests.

Two samplers (or dippers and plungers) should be available. They must be sterilised for two minutes or more in a jet of live steam, or for ten minutes in boiling water, before use. They can then be used for alternate samples, one set being rinsed thoroughly in cold water then in boiling water, while milk is taken with the second set.

Where large numbers of samples are dealt with they should be placed in iced water, or testing commenced as, say, each twenty-four samples have been taken.

Testing Procedure.—When all samples have been taken, each is shaken thoroughly and a 10-ml. quantity is poured into a sterile test tube, or, if bottles are not used, this quantity is poured direct from the dipper. To this is added 1 ml. of standard methylene blue solution, and the tube is then gently inverted once to mix, and placed in the covered constant-temperature water bath at 37 deg. C. (98 deg. F.). After thirty minutes the tubes are removed for inspection, and each is inverted once to secure an even distribution of the bacteria and cream, and replaced in the water bath. This is done every half-hour. Any samples which have decolourised entirely, or to within 5 millimetres (one-fifth of an inch) of the surface, are removed and the time noted. This marks the end of the test.

Interpretation of Tests.

A slow reduction time indicates a comparatively low bacterial content, and therefore a cleanly produced and handled milk. Rapid bleaching indicates large numbers of bacteria due to lack of care in production or holding for too long at a high temperature with a consequent shortened keeping quality.

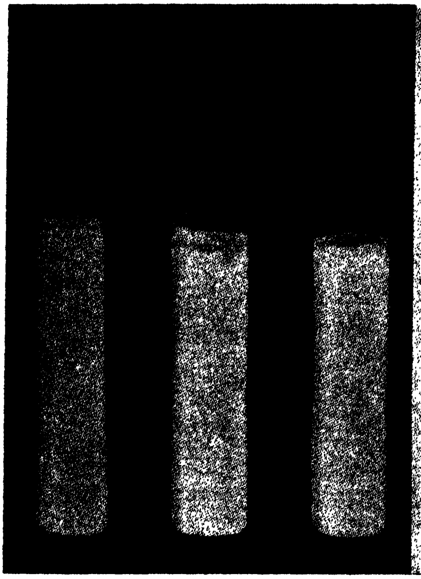
In connection with the milk quality advisory service operated by the Division of Dairying in Queensland, the following tentative standards are used: —

For the market milk trade	Good milk	Tests more than 5½ hours.
	Fair milk	Tests between 5½ and 4 hours
	Unsatisfactory milk	Tests less than 4 hours
For cheesemaking	A sample of morning's and night's milk mixed must test at least 2 hours in summer (October to March) and 3 hours in winter (April to September). When morning's milk only is supplied it should conform with standards of market milk trade.	

Legal Standards for Methylene Blue Test.—The Queensland Food and Drug Regulations, which relate to milk sold for human consumption, prescribe that milk shall not decolourise methylene blue within three hours if the sample is taken at any time from 1st October to 31st March, or within four hours if the sample is taken at any time from 1st April to the 30th September.

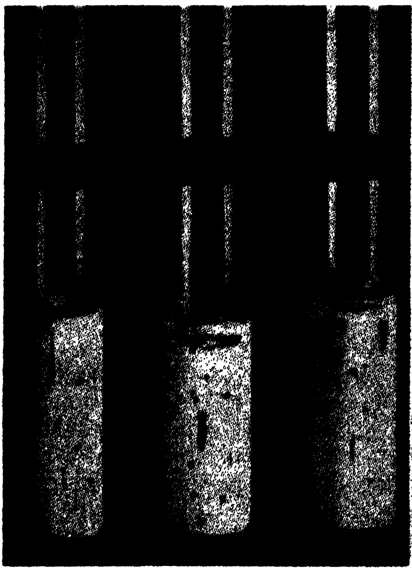
Methylene Blue Test as a Test for Pasteurized Milk.—The methylene blue test is now also used as a means of assessing the keeping quality of pasteurized milk. At 18 deg. C. (65 deg. F.) there is a close relationship between the keeping quality of milk and the time taken to reduce methylene blue. This is commercially important as a means of judging how long milk will keep after delivery to the consumer.

The test carried out at 18 deg. C. is, however, too time consuming. Pasteurized milk samples are therefore kept for twenty-four hours at 18 deg. C. in order to allow the bacteria to multiply. After the twenty-four hours' storage period, the methylene blue test is carried out in the usual manner. Pasteurized milk is regarded as unsatisfactory if it decolourises the methylene blue in less than thirty minutes.

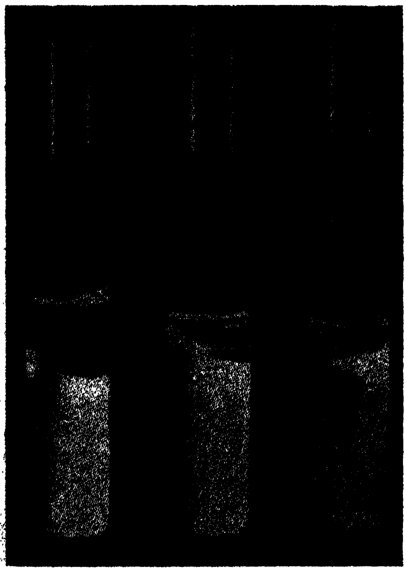


A. Gelatinous.

B. Blown.



C. Spongy.



D. Cheesy or Peptonized.

Plate 14.

COMMON TYPES OF CURD OBTAINED IN THE FERMENTATION TEST.

It should be noted that this use of the methylene blue test is primarily to ascertain the recontamination from factory equipment, bottles, &c. For checking the efficiency of pasteurization, pasteurized milk is always submitted to the phosphatase test and, according to the Health Acts of most countries, the plate count and coliform test.

The Fermentation Test.

This test is usually carried on as an extension of the methylene blue test, but may be independently conducted, in order to give an indication of the types of bacteria in milk and to this end is a useful test for advisory purposes. If the methylene blue test is extended to a fermentation test, the tubes are simply returned to the waterbath after the reduction of the methylene blue has been noted, and allowed to remain overnight. (N.B.—In factories without electricity and thus likely to have trouble in maintaining the temperature of the waterbath, the bath may be removed to the boiler room overnight to provide warmer conditions.) Next morning the coagulated curd in each tube is examined, the character of the curd giving an indication of the types of bacteria and thus of the conditions of production and handling of the milk on the farm.

Advantage.—Just as the methylene blue test gives an approximation of bacterial numbers and activity, the curd test, used as an adjunct, gives some idea of the types of bacteria which have developed in the milk. This is useful for advising farmers as to the probable cause of low-quality milk.

Interpretation of Tests.—Carefully produced milk will show a clean, smooth curd, with a pleasant acid smell. Milks less carefully produced will give gassy, peptonised, unclean and "off" smelling curds, according to the kind and extent of the original contamination and subsequent handling.

The types of curds most commonly met with (see Plate 14) may be classified according to the kind of bacteria predominating:—

Gelatinous.—Even smooth curd without gas bubbles: due to desirable lactic acid types.

Blown.—Gassy with curd collected towards the surface, and whey beneath; due to undesirable acid and gas-producing types, coliform organisms.

Spongy.—Gassy, with fine bubbles distributed throughout curd, little or no separation of whey; milk containing few desirable lactic acid types and gas-forming organisms predominating.

Peptonised or Digested.—Separation of much whey, in some cases the curd being entirely dissolved; due to casein-digesting (peptonising) organisms, and usually indicative of heavy contamination from improperly cleaned utensils.

Since the incubation temperature favours the gas-forming and casein digesting bacteria, caution is needed in interpreting a fermentation test showing slight gas if the methylene blue test was satisfactory. The fermentation test should only be interpreted in conjunction with methylene blue test results.

The Sediment Test.

This test measures the extraneous matter—hair, dust, blood clots (mastitis)—in milk. It is very useful in educating farmers to use cotton wool filter discs to strain milk at the milking shed, as the visual evidence of failure to do this is readily appreciated by producers. The simplicity of the test is a great aid in the early stages of a clean milk drive, but later, when straining becomes general practice, its value decreases. Testing the last milk in the can shows the large amount of sediment often in milk.

Advantages.—The test is well adapted to factory platform work as any person can perform it. It is simple, cheap and rapid, and the discs can be either shown to farmers who deliver their own milk, or posted.

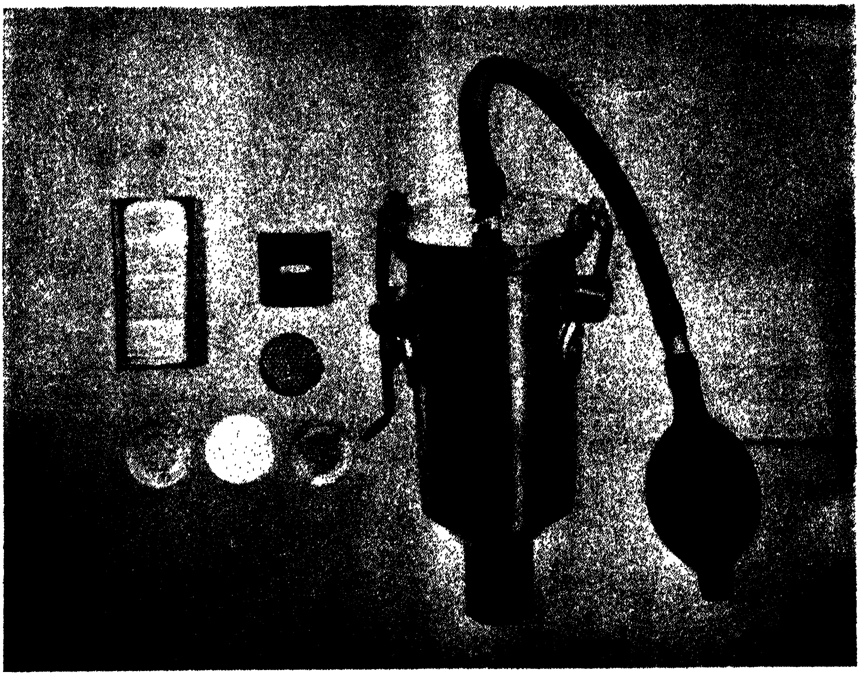


Plate 15.
MILK SEDIMENT TESTER.

Procedure.—The can of milk is vigorously stirred with a metal stirrer prior to sampling, as thorough mixing is obviously necessary to ensure that the sediment, which will have settled to the bottom of the can, is evenly distributed throughout the milk. Each can of milk may be tested, but time usually permits only one test being made from each supplier's consignment. A portion from each can may be dipped by means of a dipper or measure until the tester is full. The sediment tester commonly used in Queensland is of the type shown in Plate 15. It consists of a metal cylinder with a capacity of 1 pint, tapered at the lower end with a bayonet clip cap into which fits a cotton disc, kept in place by a wire gauze and rubber ring; the top of the cylinder is closed by a cover, to the centre of which is attached a hand-pump.

This enables the milk to be forced through rapidly, and an even distribution of sediment is obtained on the cotton disc. The milk may be returned to the bulk. The disc is then removed, placed or pinned on a piece of clean board or allowed to dry on a square of blotting paper, numbered or bearing the farmer's name, in a dust-free place. A fresh disc is placed in the tester, which is then ready for the next sample. To protect the unused discs from dust, they should not be removed from their box until just immediately before use.

Interpretation of Tests.—As a standard for guidance in clean milk competitions, marks are awarded in accordance with the amount of sediment left on the test pad after 1 pint of milk is filtered through. A maximum of 10 or 100 marks is decided upon for milk showing complete freedom from sediment, and intermediate marks allotted according to the amount of sediment. A typical set of discs is shown in Plate 16.

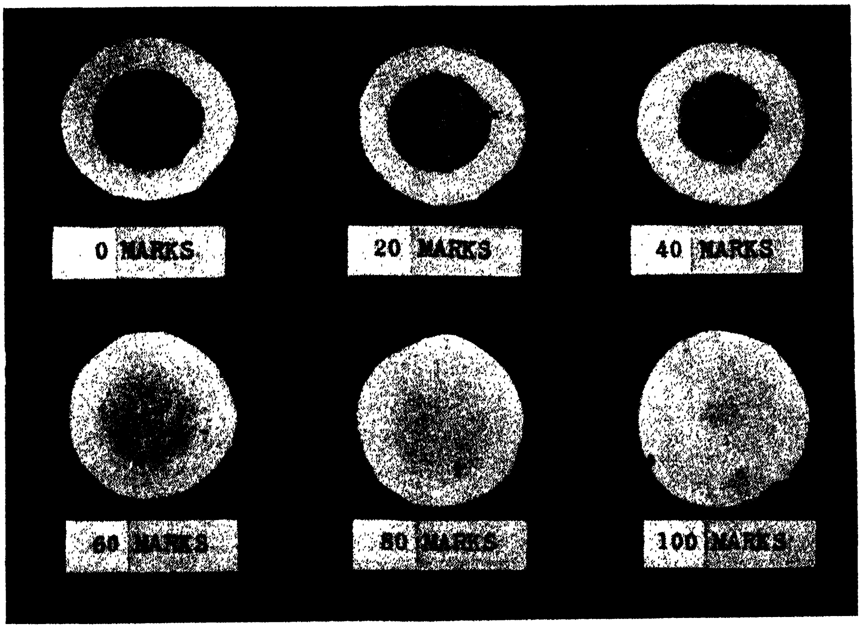


Plate 16.

SEDIMENT PADS SHOWING COMPARISONS BETWEEN RELATIVE AMOUNTS OF SEDIMENTS IN DIFFERENT BATCHES OF MILK.

In Queensland the interpretations used are—

Grade.	Conclusion.
A—Very clean .. .. .. B—Clean	Milk filtered
C—Dust specks ..	Unrinsed utensils or storage in dusty place
D—Dirty .. .. .. E—Very dirty	Milk obviously unfiltered

One test each week, of the whole supply from each farmer, made not always on the same day, will be advisable to start with—later, once a fortnight or once a month may be quite satisfactory.

The sediment test will show clearly which milk contains the largest quantity of visible dirt. It will not, however, show without some additional test which milk is the purest. It must be remembered that by thoroughly straining into clean cans on the farm and no subsequent opening of them, the farmer may succeed in removing all visible dirt, but this does not necessarily mean that his milk is really pure, for straining cannot remove the invisible impurities and obnoxious bacteria may still be present in large numbers.

In advisory work, emphasis should be more on the farmer regarding the farm strainer itself as a sediment tester, and minimising the amount of dirt which gets on the strainer cotton wool disc, rather than relying on the strainer to "clean" milk.

The Wisconsin Curd Test.

This test is mainly used at cheese factories to examine the quality of the milk from each individual supplier. It helps to pick out any milk which will give trouble in regard to flavours, texture, and keeping quality of the cheese.

Apparatus Required:—

1. Pint glass jars or 4 oz. pomade jars, preferably with aluminium or bakelite covers. The latter are a convenient size as only a small quantity of milk, yet enough for satisfactory tests, is used.
2. A water-bath. (A cut-down kerosene tin or small tub will suffice.)
3. A small oil lamp or spirit lamp.
4. Rennet extract.
5. A 2 ml. pipette, or a piece of narrow-bore glass tube, for adding rennet to the test jars.
6. A thermometer.
7. A knife for cutting the curd.

Cleaning Glassware.—All glassware must be clean and near-sterile. It should be washed after use in warm water containing a suitable cleanser and near-sterilised by placing in a vat or bucket, to which water is added to cover the contents, and then bringing to the boil by means of live steam. This should be done early in the morning or the night before so that all apparatus will be in readiness for the test.

Sampling.—As each supplier arrives at the factory, a representative sample of the well-stirred milk is placed in a sterile glass jar so that it is about two-thirds full. The lid is put on and it is then placed on one side in a cool spot, until samples from other suppliers have been taken.

Procedure.—When all samples have been collected the pomade jars are placed in the water bath and brought to a temperature of 98 deg. F. as quickly as possible. This may be accomplished by having the initial temperature of the water in the bath at 110 deg. F. The water in the bath should be level with the upper surface of the milk samples. Gently shake the jars occasionally with a rotary motion, to ensure a uniform temperature.

Place a thermometer in a separate jar containing milk for reading the temperature. When the milk reaches a temperature of 98 deg. F. add four drops of rennet extract to each pomade jar (10 drops if pint bottles are used). Mix thoroughly by giving the jars a rotary motion. Replace the jars in the water bath and observe when the milk coagulates. Allow to stand until the coagulum is firm, which usually takes twenty minutes. Then cut the curd in several thin strips and a second time at right angles to the first cut to assist in the separation of whey. Rinse the knife in hot water after cutting each milk curd before using it for cutting the curd of another jar, and so avoid carrying contamination from one milk to another. Allow the curd to settle. In about thirty minutes note the odour and flavour of the whey which will have settled in each jar, and carefully pour off the free whey. Repeat the draining of the whey at intervals over a period of six hours or more.

As the samples are held under conditions similar to those pertaining to cheesemaking, the organisms present develop readily and may give rise to "off" odours and/or texture defects. The curd jars may be left overnight in a warm place (say, near the boiler). Next morning they are finally opened, all free whey drained off and the curds examined. Each curd is cut into two pieces for this purpose.

Interpretation of Tests.—Types of curds commonly met with are:—

Firm and solid, free from gasholes on the cut surface, bright colour, pleasant aroma.—This is due to a desirable lactic acid fermentation and indicative of carefully produced milk.

Gasholes (small).—The milk contains gas-forming bacteria of the coliform type, due to utensils, manurial dust, impure water, or soil contamination. Sometimes the milk is so contaminated as to cause a puffy, spongy curd, when serious failure in dairy hygiene is indicated.

Strongly digested, off smelling curd, the curd often being largely dissolved.—Improperly cleansed utensils commonly cause this condition. Casein-digesting bacteria are often responsible for the peptonisation (breaking down of casein).

Large, round holes or fisheye slits in curd, accompanied by a yeasty or fruity aroma.—The milk is contaminated by yeasts. This is usually due to cans improperly cleaned after being used for whey. Neglected milking machines may also be responsible for this type of contamination.

"Off" aromas.—These may be caused by undesirable organisms although the texture of the curd is not affected.

Overacid, mealy, soft curd, with dull, bleached colour.—The milk contained excessive bacterial numbers as a result of poor hygiene and failure to cool and keep cool.

Soft curd.—This may be noted, especially in dry times, when the solids-not-fat content of milk is depressed.

Albuminous curd.—This may indicate the inclusion of colostrum or milk from cows suffering from mastitis.

Slimy, ropy.—These conditions usually indicate contamination from cows which have waded in dams, creeks, &c.

A rather soft, bulky curd, having a fine slimy coating.—This is often noted when the milk of a number of freshly-calved cows is included in a supply.

Contracted curd, often with a tough yellowish surface.—This is noted in curds from milk of cows in advanced lactation, or "stripper" cows.

Resazurin Test.

In England the resazurin test is used in connection with the National Milk Testing and Advisory Scheme. The test does not entirely displace the methylene blue test which is still used for high-quality milks for which a higher price is paid, and as a test to define a standard below which milk for the market milk trade cannot fall without risk of the producer being prosecuted.

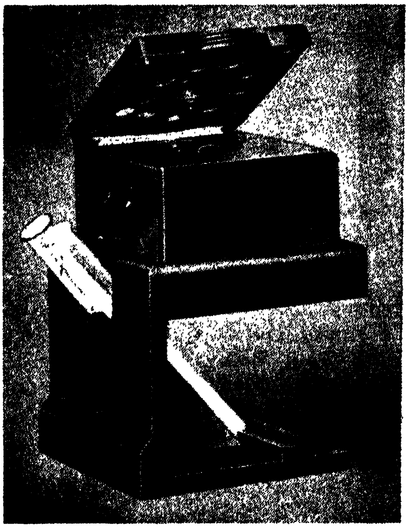


Fig. 1.

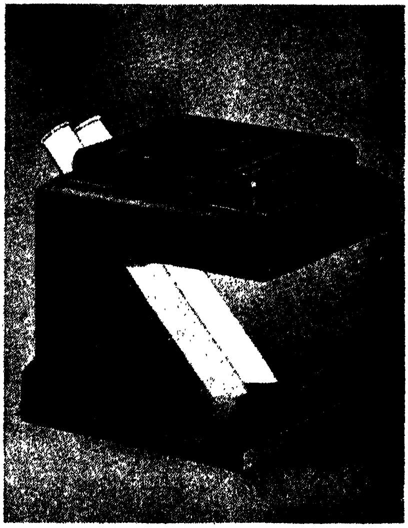


Fig. 2.

Plate 17.

TWO TYPES OF COMPARATOR USED FOR THE RESAZURIN TEST.

Advantages.—The advantages claimed for the resazurin test over the methylene blue test lie in the quick result given, a ten minute test having been developed, and its ability to differentiate pathological (mastitis) milk. The principal use of the resazurin test is to enable suspected poor-quality milk to be rapidly tested and kept apart from milk satisfactory for pasteurizing for the liquid milk market, and also in connection with milk quality control schemes, to direct field officers' assistance where it is most needed.

Sampling.—The precautions in sampling and care of glassware already described in discussing the methylene blue test apply equally for the resazurin test.

Apparatus.—The same equipment is used as for the methylene blue test and additionally a colour comparator (Plate 17) is required.

Making up the Resazurin Solution.—Distilled or tank water is boiled for thirty minutes and allowed to cool. When the water is cool, measure 50 ml. into a clean sterile measure, add one resazurin tablet and shake to dissolve. This gives a .005 per cent. solution for using in testing milk. A fresh batch of solution must be prepared for each day's testing. Names of suppliers of approved resazurin tablets will be supplied by the Department of Agriculture and Stock, on request.

Procedure.—A thoroughly representative sample of the milk is taken and 10 ml. placed in the test tube. 1 ml. of a .005 per cent. solution of resazurin is added, the tube stoppered and inverted twice. It is convenient to work with batches of five tubes, placing them simultaneously in the water bath, kept at 37 deg. C. (98.6 deg. F.) noting the time, and after ten minutes removing them from the water bath and immediately matching the colour which has developed against the appropriate colour disc in the comparator. To do this, place the tube of milk in the instrument and rotate the discs until the disc which matches the colour in the milk tube is noted. Record the disc reading. During the test the resazurin-milk mixture may change from a blue colour through mauve to deep pink and finally, with bad samples, to white. The standard resazurin test colour glasses, numbered 0 to 6, are as follows:—

Colour Glass No.	Colour.
6	Blue
5	Slightly mauve
4	Mauve
3	Pink-mauve
2	Pink
1	Deep pink
0	White

Interpretation of Test.—

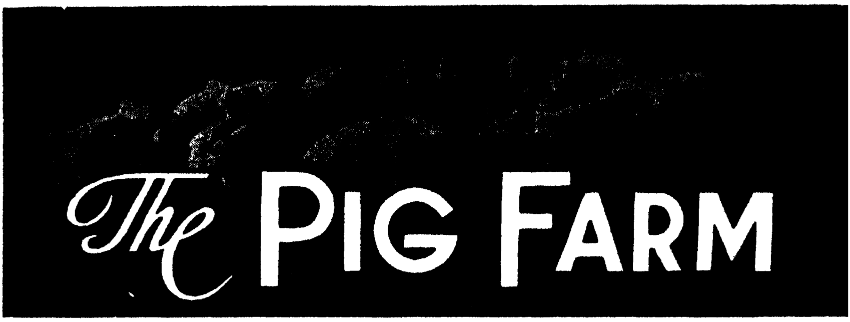
Resazurin Disc Reading	Milk Category
4 or higher	A. Good-quality milk suitable for pasteurizing for liquid consumption.
3½ to 1 (both inlusive)	B. Insufficient care in production and handling. Milk only fit to be used for manufactured products.
½ and 0	C. Very poor hygiene in production. Milk rejected and returned to producer.

PRODUCTION RECORDING.

List of cows and heifers, officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. and Jersey Societies' Herd Books, production records for which have been compiled during the month of May, 1947 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production. Lb.	Butter Fat. Lb.	Sire.
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
Tara Flower	C. K. Roche, Warwick	10,223·45	430·409	Murray's Bridge Pansy's Gift
Bileena Flo 2nd	C. K. Roche, Warwick	10,108·1	383·899	Tara Governor
JUNIOR 4 YEARS (STANDARD 310 LB.).				
Sydmouth Lorna	T. Vayro, Helidon	7,543·4	358·69	Sydmouth Beauty
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Navillus Showgirl 4th	C. O'Sullivan, Greenmount	14,714·8	516·233	Greyleigh Eros
Mt. Camp Thelma 34th	Madge Bros., Southbrook	10,172·56	392·79	Rosenthal Red Major
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Fairvale Laurel 2nd	W. S. Henschell, Yarranlea	12,712·9	590·243	Bingleigh Jean's Monarch
Fairvale Doris 7th	W. S. Henschell, Yarranlea	10,166·4	455·823	Bingleigh Jean's Monarch
Yarranvale Madge	W. D. Davis, Chinchilla	6,913·05	322·592	Sunny View Royal National
Pilton View Sally 3rd	C. K. Roche, Warwick	7,230·0	270·545	Sunny View Myrtle's Renown
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Fairvale Minerva 3rd	W. Henschell, Yarranlea	9,222·15	379·67	Bingleigh Jean's Monarch
Sunnyside Daisy 45th	R. Moore, Kingaroy	6,662·8	269·587	Cosy Camp Isaac
Sydmouth Vivian	T. Vayro, Helidon	6,793·25	260·166	Navillus Paros
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Trevor Hill Fairy Dove 3rd	Madge Bros., Southbrook	6,762·54	308·465	Trevor Hill Bosca
Fairvale Doris 10th	Madge Bros., Southbrook	6,000·16	262·884	Fairvale Reward
JERSEY.				
MATURE COW (STANDARD 350 LB.).				
Westwood Larkspur	F. Porter, Maleny	8,284·9	526·524	Hunstrete Emperor's Volunteer
Gem Leila	W. Bishop, Kenmore	9,949·75	510·412	Calton Lothean
Westwood Goldilocks	F. Porter, Maleny	8,307·2	496·170	Hunstrete Emporer's Volunteer
Lermont Bud	J. Schull and Sons, Oakey	9,205·55	461·533	Selsey Samares Hallmark
Morago Loyal Watch	W. Bishop, Kenmore	8,557·0	428·155	Oxford Robin
Trinity Cute Dove	F. Z. Eager, Petrie	8,478·45	421·858	Samares Cute Prince 3 (imp.)
Trinity Crowning Daisy	J. Sinnamon and Sons, Moggil	7,882·15	407·941	Trinity Crowning Effort
Elwyn Bright Eyes	E. J. Dunning, Stanmore	8,060·85	384·53	Glenside Lone Star
Jersey Park Golden Thread	R. J. Browne, Yangan	7,527·9	377·327	Trinity Pioneer
Romsey Blossom	J. Wilton, Killarney	7,274·6	375·3	Oxford Dainty Peer
Trinity Cute Poppy	J. Sinnamon and Sons, Moggil	7,137·11	362·362	Samares Cute Prince 3 (imp.)

SENIOR, 4 YEARS (STANDARD 330 LB.).				
Westwood Silver Bells	F. Porter, Maleny	9,386·35	610·83	Westwood Brown Victor
JUNIOR, 4 YEARS (STANDARD 310 LB.).				
Trinity Princess Rose	J. Sinnamon and Sons, Moggil	9,104·6	484·428	Trinity Lily's Lad
Trinity Princess Royal 2nd	J. Sinnamon and Sons, Moggil	8,120·11	459·097	Trinity Crowning Effort
Trinity Graceful Lady	J. Sinnamon and Sons, Moggil	9,201·91	453·837	Trinity Crowning Effort
Trinity National Girl	J. Sinnamon and Sons, Moggil	7,438·57	362·788	Trinity Crowning Effort
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Nairfale Lady Laura	R. J. Browne, Yangan	6,888·1	367·141	Nairfale Noble Count
Elwyn Noble Lassie	E. J. Dunning, Stanmore	6,517·55	366·571	Navua Noble Lad
Navua April Dawn	C. A. Edwards, Alderley	7,324·75	364·253	Dreamer's Hamptonne Star
Elwyn Rose Marie	E. J. Dunning, Stanmore	5,279·2	275·984	Navua Noble Lad
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Lermont Bright Girl	J. Schull and Sons, Oakey	5,858·4	352·131	Selsey Samares Hallmark
Elwyn Noble Queen	E. J. Dunning, Stanmore	6,106·8	322·734	Navua Noble Lad
Glenview Faith	F. Z. Eager, Petrie	6,080·95	303·585	Trinity Gov. Hope
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Nairfale Likeness	R. J. Browne, Yangan	7,101·1	352·897	Nairfale Golden Receiver
Boree Gift's Pleasure	A. Visini, Gympie	6,777·7	319·77	Maurfield Larkspur's Gift
Ashview Pearl	C. Huey, Sabine	4,996·2	275·419	Trecarne Victor 4th



Shade Trees and Windbreaks on the Pig Farm.

T. ABELL, Assistant Adviser, Pig Branch.

ACKNOWLEDGMENT is due to the Government Botanist and officers of the Forestry Department for supplying information regarding species of trees and their distribution included in the following notes.

To obtain good results in the piggery the stock should be of the correct type, properly fed, and housed to ensure the maximum of comfort and freedom from disease. Where pigs are run in paddocks some provision should be made for shelter from the hot summer sun and protection from cold winter winds, in addition to the dry sleeping quarters. This can be done cheaply and profitably by planting the most suitable trees.

Windbreaks and shade trees are valuable not only for their primary use as shelter; when planted in rows as windbreaks they give valuable aid in preventing erosion of the paddocks, and some of them have a cash value as mill timber when mature.

As even the quickest growing trees require a few years to reach a useful size, and may be expected to live for many years, haphazard planting should not be made. Careful planting will save errors which may not otherwise be noticed until the trees have been planted for some years.

Firstly the farmer should decide the number of pigs his farm is capable of carrying and allot the area of land for the piggery accordingly, making provision for any proposed increase if necessary. Then he should consider the piggery layout and, when a good plan has been evolved, stick to it. An established piggery may not be built to a suitable plan, in which case gradual alteration over a number of years may be planned to convert it. Therefore the tree plantings should be made with a definite future objective in view, so that when the piggery is completed the trees will be in their correct places. Windbreaks thus will be planted so that the trees are along the boundary of the piggery from which the troublesome winds blow, and shade trees placed so that the pigs can use the shade from the hot afternoon sun.

Careful thought should be given to selection of trees. It is necessary to choose those which suit the climatic and rainfall conditions of the district, resist frosting, make fairly rapid growth, and live for a number of years. It is a good plan to look around the district and note the trees

that thrive under conditions similar to those on the home farm. Also, if any school forestry plots are in the neighbourhood, they should be inspected to see what some of the unfamiliar trees are like, and if they are likely to do well at home. If an officer of the Forestry Department is stationed in the district a talk with him will ensure the selection of suitable trees for your conditions.

There are two classes of tree from which to make a choice, native trees and imported species. Many of the native trees provide good shade, and if rapid-growing varieties are planted they are quite suitable. Those that are inclined to grow tall are often improved by judicious lopping to increase the number of spreading branches. Certain trees which carry scanty foliage when growing in scrub or forest make excellent well-spread shade trees when planted singly in the open. The Brigalow (*Acacia harpophylla*) is a good example of this type.

Plate 18.

A windbreak of *Pinus patula,* giving the required compact shelter to a suitable height.

[*Photograph by courtesy of the Forestry Department.*

Shade trees should carry a fairly dense foliage on branches well spread out from the trunk. It will be necessary to prune the lower branches from some to give ample clearance above the ground and allow the early morning sunshine to penetrate beneath the tree and help to keep the ground sweet and dry. The Poinciana is an excellent shade tree, as the head of well-spread foliage is carried several feet above the ground. It is, however, subject to frost damage.

Deciduous trees are useful in certain positions, as they provide shade in summer, and when the leaves have fallen in winter the sun can sweeten the ground beneath the tree. The Mulberry and Jacaranda are two good examples, as they will grow in a wide range of soils, provided there are no heavy late frosts to kill new growth.

Plate 19.

When grown singly in the open many of the native trees provide good shade. The young Silky Oak above is carrying ample well-spread foliage.

Of the better known trees the Mango, Weeping Fig, Jacaranda, Poinciana, Camphor Laurel, Portuguese Elm, and Silky Oak provide good shade; the Queensland Nut, Cape Chestnut (*Caledendron capense*) and *Buddleia madagascariensis* are suitable for positions where smaller trees are required.

Trees for windbreaks are required to provide compact shelter to a fair height rather than to spread over a large area, hence different trees are generally used, though some of the shade trees make good

windbreaks when planted in rows. The windbreaks should be planted outside the piggery fence so the pigs cannot root up the ground and make wallows beneath the trees. Planting in two rows is generally recommended, distance between trees and rows varying according to the tree planted and whether pruned or not. For instance, the Mexican cypress is planted 8 feet between trees, 5 feet between rows, with the trees of the second row opposite the centre of the gaps in the first row, when unpruned, and about 5 feet apart when pruned to a fairly low windbreak.

As many trees do not give complete shelter down to ground level it is advisable to plant shrubs as a low hedge on the outside of the windbreak. Some native shrubs can be used for this work, a good specimen in the lighter coastal soils being *Leptospermum citratum* (lemon-scented ti-tree). Others such as Privet, Cassia, Buddleia, Pittosporum, and the Mexican and Arizona Cypress give good low shelter if planted a few feet apart and pruned to form a dense mass.

Plate 20.

The dense foliage of this Broad-leaved Pepperina is carried well above the ground, allowing the morning sunshine to keep the earth beneath the tree dry and sweet.

[*Photograph by courtesy of the Forestry Department.*

In addition to the native trees and others used in parks and gardens, several of the pine and cypress species are useful if soil and climatic conditions are favourable. These trees in general are resistant to frost. As a guide to plantings in the area from Rockhampton to the southern border, embracing the main pig-producing areas, some suggestions are given below. It should be remembered that these are only suggestions, and the remarks in the paragraph on tree selection should be noted carefully before making a selection.

COASTAL AREAS.

Rainfall over 40 Inches.

Windbreaks—

Sandy soils: *Callitris cupressiformis* (Coastal or Sand Cypress), *Callitris columellaris.*

Heavier soils: *Cupressus lusitanica* (Mexican Cypress).

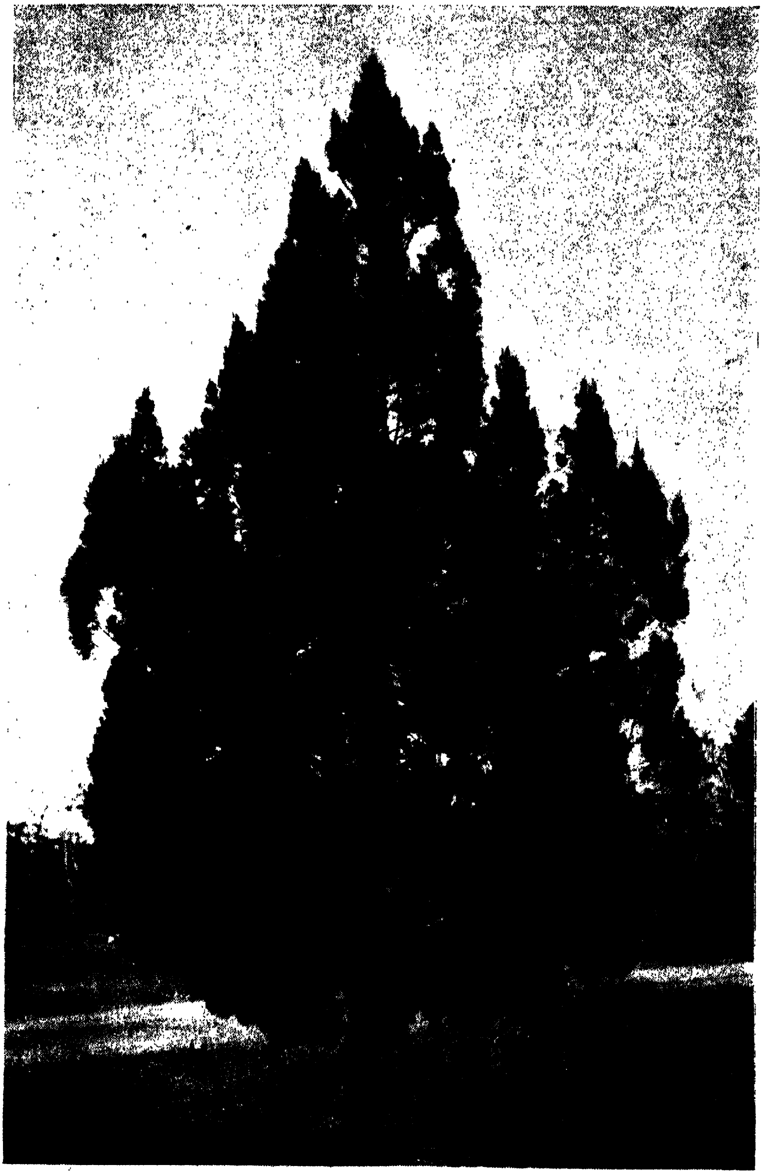


Plate 21.

The Sand Cypress does well on the light sandy soils of the coastal belt. In addition to forming a good windbreak when planted in double rows, well-grown single specimens are useful shade trees.

Shade Trees—

Pinus taeda (Loblolly Pine), *Pinus caribaea* (Slash Pine), *Pinus patula* (Patula Pine).

Remove the lower branches from these three pines as they grow to obtain headroom. They can also be planted in two rows to form windbreaks.

On scrub soils the Patula Pine, Hoop Pine, and the Queensland Nut will give good results, the latter two away from heavy frosts.

Plate 22.

When the lower branches are removed to give ample head room the *Pinus patula* is a shapely shade tree. Compare the manner of growth with the same trees in the windbreak.

Plate 23.

The Western Cypress prefers a light sandy soil. Like the Coastal or Sand Cypress, it may be used for windbreaks or shade trees.

30 Inches to 40 Inches Rainfall Areas.

Windbreaks—

Cupressus arizonica (Arizona Cypress. Prefers deeper soils).

Shade Trees—

Pinus patula (Patula Pine).

The broad-leaved Pepperina (*Shinus terebinthifolius*) is a good shade tree, as it is flourishing under a wide range of soil and climatic conditions.

DARLING DOWNS.

Windbreaks—

Except in heavy black soils: *Cupressus arizonica* (Arizona Cypress). *Cupressus torulosa* (Torulosa Cypress), *Cupressus lawsoniana* (Lawsoniana Cypress).

Shade Trees—

Except in heavy black soils: *Pinus patula* (Patula Pine), *Pinus longifolia* (Chia Pine), *Platannus occidentalis* (Plane Tree).

Windbreaks—

Heavy soils: *Pinus longifolia* (Chia Pine. Two rows), *Cinnamomum camphora* (Camphor Laurel).

Shade Trees—

Heavy soils: *Pinus lonifolia* (Chia Pine), *Cinnamomum camphora* (Camphor Laurel), *Grevillea robusta* (Silky Oak).

In the lighter sandy soils of the Downs, the Western Cypress (*Callitris glauca*) is a useful tree for shade or windbreaks.

In addition the Jacaranda, Pepper Tree, Chinese Celtis (*Celtis sinensis*)—sometimes called Portuguese Elm—Phytolacca bella sombra, Brigalow, and Wilga are good shade trees for the Darling Downs.

GRANITE BELT.

Windbreaks—

Cupressus lusitanica (Mexican Cypress), Cupressus arizonica (Arizona Cypress).

Shade Trees—

Pinus patula (Patula Pine), *Pinus radiata* (Insignis Pine).

The above list is mainly to show the distribution of the pine and cypress trees and is not a list of all suitable species. Many trees mentioned in the text, such as the Mango, Jacaranda, Fig, Broad-leaved Pepperina, Silky Oak, Portuguese Elm, and Camphor Laurel, have a wide distribution and can be grown successfully in a number of districts.

The following trees may be obtained by applying to the Secretary, Forestry Department, George Street, Brisbane:—

Callitris cupressiformis, Cupressus lusitanica, Cupressus arizonica, Hoop Pine, Silky Oak: Supplied in planting tubes at 35s. per hundred.

Pinus taeda, Pinus caribaea, Pinus patula, Pinus radiata, Pinus longifolia. Price 10s. per 100, but not in planting tubes.

Many of the other trees can generally be obtained from nurserymen, cost depending on size of the tree and its availability.

Plate 24.

When grown under suitable soil and rainfall conditions the Slash Pine (*Pinus caribæ*) quickly develops into a useful shade tree.

All trees when planted should be protected from stock. Windbreaks should be outside the piggery fence, and if necessary cattle kept away by a second fence. Shade trees in the piggery should be protected by a strong tree guard, for the pigs will root out or ringbark unprotected trees. When there is a possibility of the young trees being damaged by frost or hot sun some form of covering should be placed over the guards. Never plant trees in hollows or positions where the ground may become waterlogged.

Farmers are advised not to plant the White Cedar, as the berries from this tree are poisonous to pigs.

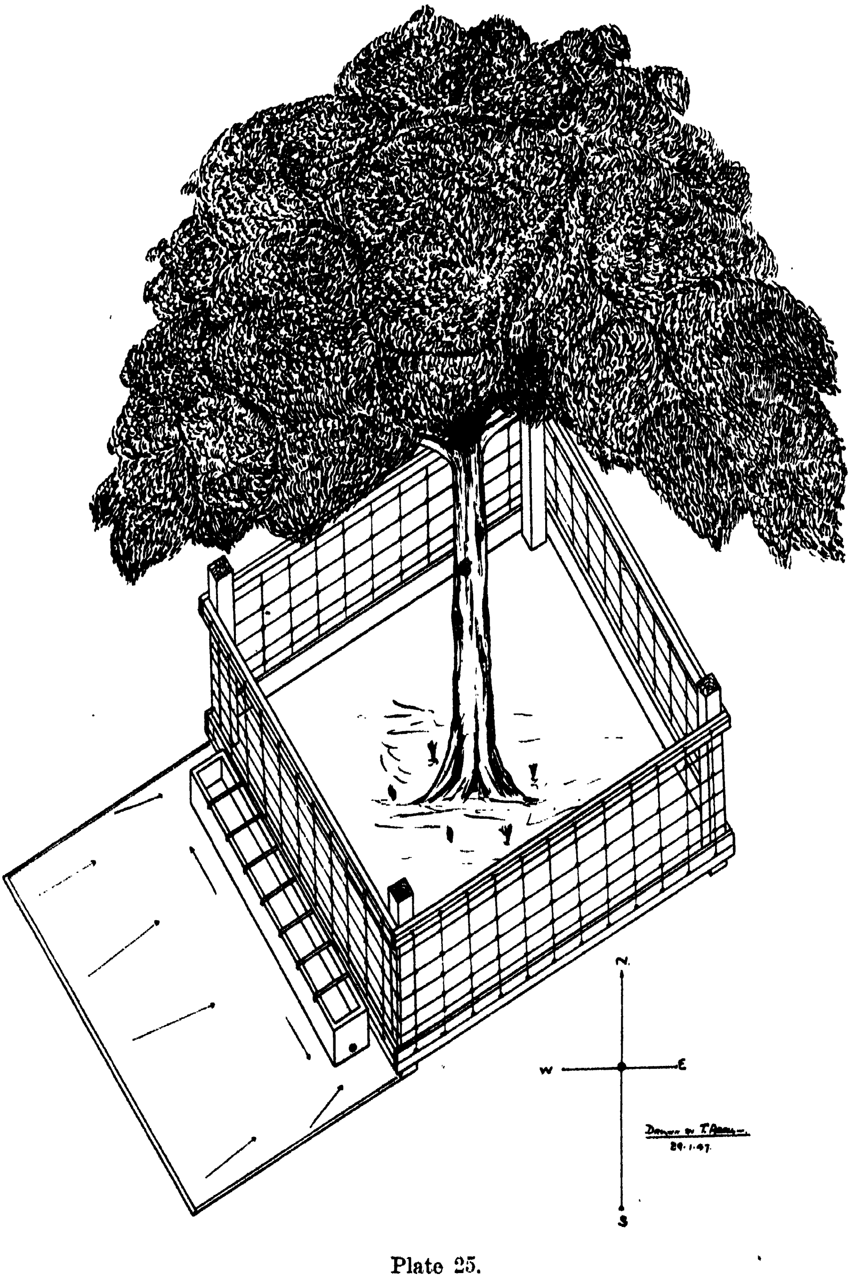


Plate 25.

Plan of combined shade tree and water trough. A shed may also be built to take advantage of the tree's shade.

A method of supplying clean cool drinking water to pigs without having a sloppy mess around the trough, and at the same time providing water for the shade tree, is given here. It is advisable to plant a tree that does not lose its leaves, and the soil must be well drained.

A concrete floor is laid down with a trough 6 inches to 9 inches deep and 9 inches wide let into it; the trough has bars let into the top at 10-inch intervals. The floor has a slight fall to the side nearest the tree with a raised lip on the other three sides, so that any water spilled drains to the lower side. A tree is planted on this side and securely fenced off from the pigs. As the tree grows it should be encouraged

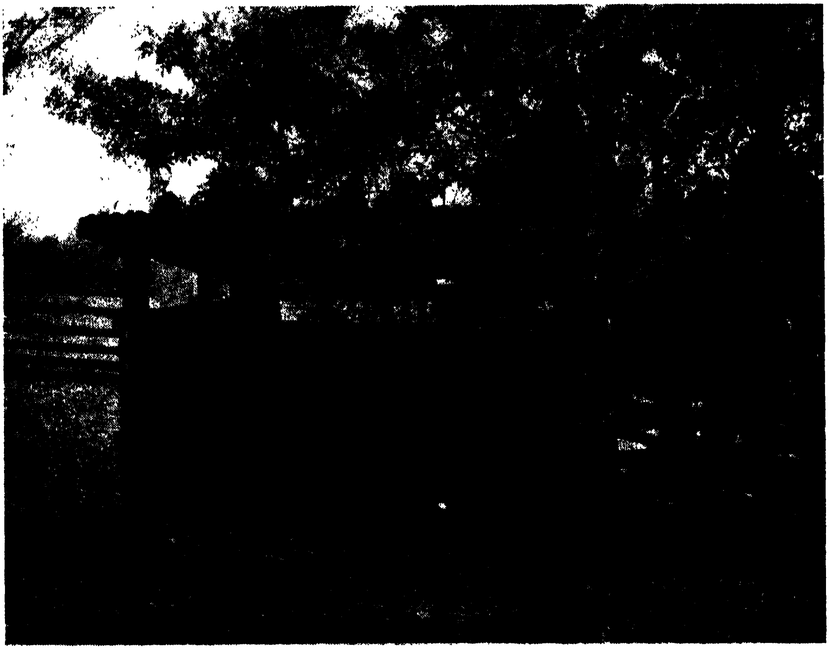


Plate 26.

This shed is kept cool by the Broad-leaved Pepperina planted on the sunny side. Note the strong tree guard to keep the pigs away from the roots.

to spread its lower branches about 8 feet above the ground. Full use of the tree may be made by building a shed on the north-eastern side of the tree, and the trough will then be on the south-western side. With this arrangement the morning sun will shine into the shed and under the tree; the shed and trough will be shaded from the sun during the hotter part of the day.

Wallows and accumulations of damp dead leaves beneath trees are possible sources of infection by worm parasites, hence it is necessary to allow the morning sun to penetrate beneath the tree; remove and burn dead leaves, prevent wallows forming by providing adequate drainage, and erect a pig-proof tree guard.

Trees intelligently used around the piggery can help considerably in the task of keeping the pigs healthy and contented, and any effort required to establish them will be repaid amply in the future.

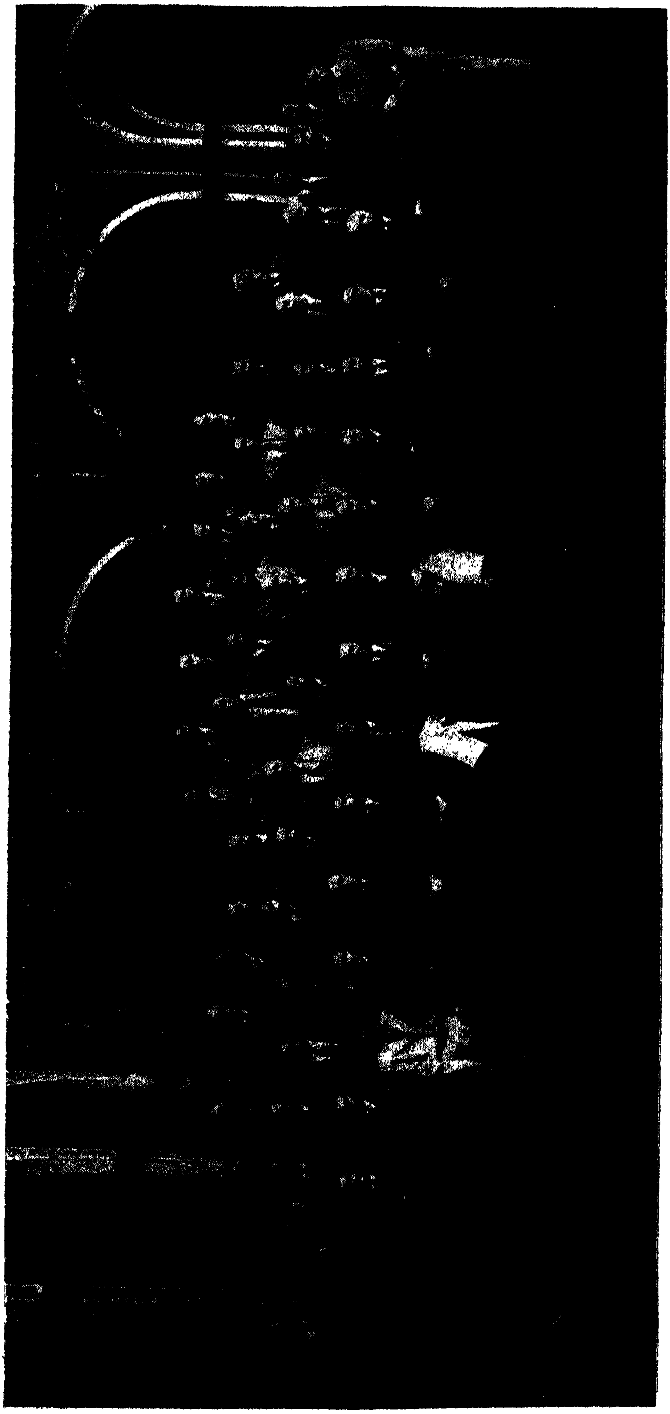


Plate 27.

ANNUAL CONFERENCE OF THE AUSTRALIAN VETERINARY SURGEONS' ASSOCIATION, BRISBANE, JUNE, 1947.

MARKETING

Marketing and Economic Notes for June.

Markets in the East.

"WHAT will be the world pattern of production and trade a few decades hence? When the Orient becomes industrialized, it will have a greater density of population per square mile than any other continent, even greater, perhaps, than the United Kingdom. It will be impossible for the Orient to feed itself on any reasonable nutritional standard, even if per acre yields were brought up to the level of the Netherlands. The logic is that the Orient when it can afford to will become a permanent importer of a part of its food supply and the tonnage involved will be enormous. The food can only come from the more sparsely populated continents, Australia, North and South America, and perhaps Africa."

(Extract from an address presented by P. Lamartine Yates, Food and Agricultural Organisation, at the annual meeting of the American Farm Economics Association, Philadelphia, December 27, 1946.)

World Food Supply.

Despite world-wide efforts to increase production, early crop conditions in important producing areas indicate that the world food supply for the 1947-48 consumption year may be little, if any, larger than in 1946-47, according to the United States Department of Agriculture. Declines in grain production are indicated in several importing countries, but may be offset by increased production in the principal exporting regions.

Central Queensland Egg Marketing Board.

Egg producers in Central Queensland, with the assistance of the Marketing Division of the Department of Agriculture and Stock have established a producer-controlled marketing board for eggs in the region extending from Bundaberg to Mackay.

The Egg Board has assumed control as from the 1st of July and has arranged with the Central Queensland Meat Export Company at Lakes Creek, Rockhampton, to act as its agent in the receiving, handling and marketing of eggs.

Producers in this area now control their own industry in their own interests and thus will assist in placing their industry on a firmer footing.

Production Trends—June.

Milk and cream production is declining as herds are drying off, but quality is satisfactory, and dairy cattle are holding condition.

Receivals of eggs by the Queensland Egg Marketing Board during June were approximately 398,600 dozen as compared with 342,846 dozen for June, 1946.

Cotton ginnery receivals during the month were light, and difficulty is being experienced in securing pickers. Grades and staple lengths of most consignments have been satisfactory.

Fruit and vegetables have matured more slowly than was anticipated, because of dry, cool weather conditions.

It is estimated that the 1947 sugar crop will produce 550,000 tons of sugar.

Stock generally in the pastoral areas are maintaining their condition, and prospects for supplies for slaughter are fairly good.

GENERAL NOTES

Staff Changes and Appointments.

Following the appointment of Mr. A. F. Bell as Under Secretary of the Department of Agriculture and Stock, Mr. R. Veitch, B.Sc. (Agric.), B.Sc.For., F.R.E.S., Director of the Division of Plant Industry, has been appointed Assistant Under Secretary (Technical) in the Department. Mr. Veitch is a graduate of the University of Edinburgh, and after service in Fiji, joined the Department as Chief Entomologist in 1925. He became Director of the Division of Plant Industry (Research) in 1937.

W. A. T. Summerville, D.Sc., Director of Horticulture, succeeds Mr. Veitch as Director of the Division of Plant Industry. Dr. Summerville joined the Department in 1922, and was for some years Officer in Charge of the Horticultural Field Research Station at Nambour. In 1936 he was sent abroad by the Department and made extensive travels investigating methods of production.

Mr. N. J. King, Senior Adviser, Sugar Experiment Station, Bundaberg, has been appointed Assistant Director of the Bureau of Sugar Experiment Stations, Department of Agriculture and Stock.

Mr. King joined the Department in 1922. In 1938 he represented Queensland at the International Conference of Sugar Cane Technologists held in Louisiana.

The resignation of Dr. F. H. S. Roberts as Acting Director of Research in the Division of Animal Industry has been accepted. Dr. Roberts has been appointed to an important position in the Council for Scientific and Industrial Research, but it is understood that his services will still be available to the pastoral industry of Queensland.

Dr. J. Legg will assume the position of Director of Research in the Division.

Mr. A. R. Nott, Acting Divisional Veterinary Officer, Rockhampton, has been appointed Divisional Veterinary Officer, Department of Agriculture and Stock, Rockhampton.

Fertilizer Rationing.

The Minister for Agriculture and Stock, Mr. H. H. Collins, has announced that because of the shortage of sulphate of ammonia available for import into Australia, it is necessary to reintroduce a modified system of rationing. A limited amount of nitrate of soda will be available free of rationing.

Sulphate of ammonia will be available for use in the production of fruit and vegetables only in mixtures, and mixtures will not be permitted to contain more than 10.5 per cent. nitrogen in the form of sulphate of ammonia. As mixtures are not required in the Lockyer and Fassifern districts, potato growers in those districts will be granted a limited quantity of straight sulphate of ammonia. No straight sulphate of ammonia will be available for any other fruit or vegetable crop.

Sugar growers, if they desire to use either straight sulphate of ammonia, or sulphate of ammonia in the form of mixtures, should place orders with the dealer of his choice before the 15th August, 1947. So far as the grower is concerned, no further application will be required.

Rations will be announced as early as possible. In the meantime, in order to spread delivery and take advantage of any transport facilities that are available, any sugar grower who desires straight sulphate of ammonia may obtain not more than one-half of the amount of his ration during the period 1st July to 31st December, 1946.

All straight sulphate of ammonia delivered as from the 1st June, 1947, onwards will be taken as part of the grower's ration.

The position will be reviewed as soon as the supply position warrants. Other fertilisers will not be subject to rationing.

D.D.T. in Tick Control.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has announced the receival of a progress report on experiments carried out in the Brisbane Valley area in the use of D.D.T. for tick control. These experiments with D.D.T. at a strength of ·5 per cent. were initiated in June, 1946, since when over 5,000 head of stock have been through a dipping vat provided for the purpose, and the results were very satisfactory. Consequently it was subsequently decided in October last to charge a second vat with D.D.T. at a strength of ·25 per cent., and the result of this experiment should be available soon.

The property on which the experiments are being conducted carried cattle heavily infested with ticks when the experiments were initiated, in spite of regular dipping in arsenical preparations. Since October last no arsenic has been used in the dip, and, notwithstanding that conditions on the property have been favourable for tick life, infestation is lighter than for many years.

The Minister has advised that further work will be continued on the use of D.D.T. preparations for dipping of ticks, not only to ascertain its efficacy for eradication, but also to check up on the most economic methods for its use.

Price of Raw Sugar.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has announced the issue of a proclamation fixing the delivery price of raw sugar for the 1947 season at £18 4s. per ton f.o.b., for up-to-peak sugar. Conditions of acquisition are the same as last season. He wished to re-affirm that it was the intention of the Government to adhere to the f.o.b. policy, said Mr. Collins. Under this basic principle, the mill-owner is responsible for costs, charges, storage and losses until his sugar is delivered to the Sugar Board f.o.b. in accordance with the proclamation.

Consideration has been given to the position of excess sugar and, although little excess sugar may be produced this season, it has been decided to maintain past principles under which excess sugar was marketed outside the No. 1 pool if a market could be found for it. At present, there is an unsatisfied market which will return a higher price than the No. 1 pool.

Sugar Board arrangements include a scheme for equitable removal of raw sugar from the various districts, and, under normal conditions, this operates justly if sugar can be shipped in accordance with the scheme. Where interruptions to shipments occur because of industrial trouble, or any other cause, difficulties arise; but this may occur under any scheme.

In-store advances made on sugar in stock and the taking over of deterioration on sugar not shipped by the end of February remove to a great extent the burden on mill-owners by delayed or unequal shipments. These measures may not materially assist districts which get their sugar away expeditiously, but help very much, as they were designed to do, districts which may be under the disadvantage of inadequate clearances.

Ginger Marketing Board.

Mr. G. C. Burnett, of Buderim, has been elected unopposed as growers' representative on the Ginger Marketing Board to fill the vacancy caused by the death of Mr. L. T. Kurburgh.

State Wheat Pool Election.

The Regulations dealing with State Wheat Board Elections under *The Wheat Pool Acts*, 1920 *to* 1930, have been rescinded, and new Regulations issued. In the main, the new Regulations provide for the substitution of straight-out voting for preferential voting, and the insertion of provisions dealing with the submission of nominations by candidates.

It is provided that candidates may withdraw from the election after nomination, provided they deliver a signed notification not later than three days after the closing date for nominations. It is also provided that if a candidate dies or becomes disqualified between the closing date for nominations and the date of the election his name will be omitted from the ballot-papers if they have not then been prepared. If they have been prepared, but not issued, the candidate's name will be deleted; and if they have been prepared and issued, any votes cast for the dead or disqualified candidate will be disallowed. Certain representations were made for an alteration of the system of voting from the block system to the ward system, but it has been provided that the block system shall be retained.

Rural Topics

Makers Learn from Users.

"Let the other fellow experiment" is a saying that looks all right at first glance, but the implication is that the farmer should never get off the well-defined road, or out of the old well-worn rut. "Nothing venture, nothing win," and often it is a good thing to straddle the rut, or find a new way round. Take agricultural machinery, for instance. How often has the maker been indebted to the user? In fact, many of our modern farm implements and machinery units had their origin in the fertile brain of farmers, who gave a lot of thought to the finding of easier and quicker ways of doing a job. Machinery makers acknowledge the value of many a suggestion that farmers have made for the more effective working of their field units. A famous agricultural machinery manufacturer, addressing a gathering of farmers many years ago, said that "the makers must learn from the users." So, if we are satisfied always to let the other fellow experiment and do not use our own brains and opportunities, or if we keep the results of our own experience to ourselves, we may be guilty of mental laziness or carelessness, thoughtlessness, or even selfishness. The fact remains, however, that users have given manufacturers something more than useful hints. This form of co-operation is obviously valuable to rural industry generally.

Keep the Tractor in Trim.

The increased use of mechanical power since the war makes it timely to remind farmers that no machine will continue to yield its best performance without something more than routine attention at intervals, and the tractor that has a season of hard work behind it will now repay expert scrutiny and adjustment.

Skilled inspection makes it possible to correct small troubles which, if neglected, may entail costly repairs and the loss of the tractor when it is urgently needed. The result will be the added certainty of full power and efficiency whatever the job, and of trouble-free running during the busy days ahead.

Periodic inspection and overhaul is essentially a job for the trained mechanic using modern tools. Leading dealers, for example, are equipped with scientific instruments for tracking down troubles at an early stage and specialised tools for correcting them. Similar results cannot be obtained by rule-of-thumb methods.

It is not possible to give an exhaustive list of points likely to need attention. Everything depends upon the length of time that the tractor has been in service, and the manner in which it has been handled and maintained.

The serviceman can check the engine for power and regular running, correcting any mechanical faults that have developed, and adjusting the fuel and ignition systems. Any sign of knock in the engine or transmission should be carefully investigated and remedied before serious damage occurs.

Engine knocks often indicate the need for adjusting big end or main bearings, although if the tractor has been in use for some time the cause may be "carbon knock," the cure for which is decarbonisation.

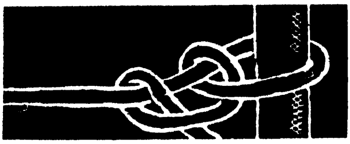
The garage man can also check the steering, clutch and transmission, brake adjustment, wheel bearings, &c. He will satisfy himself as to the efficiency of the cooling system, and check the condition of all oil and grease retaining washers and covers.

If the paint has become badly damaged we suggest the advisability of repainting, which is desirable to prevent rust spread.

GADGETS AND WRINKLES

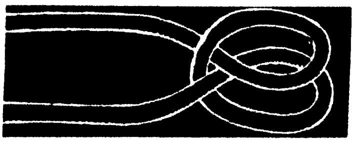
HANDY HITCHES.

Hitches form a useful group of knots similar in construction to the true knot, with the exception that its free end is usually held against the object by the tight part of the rope.



The double half hitch (Sketch 1) makes a secure fastening, even when the load is intermittent.

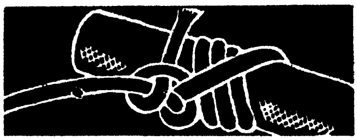
It is made by tying a half hitch in the usual way. After the end of the rope has been passed through the loop, it should be brought under around the standing part of the rope and through the loop formed.



The clove hitch, useful for fastening guy ropes to posts or securing rabbit snares to pegs, is made by forming a loop by passing the end of the rope under the standing part fairly well back from the end of the rope. Form a second loop, similar to the first loop. Pass the second loop over the first loop (Sketch 2*a*) and slip the double loop formed over the object to which the rope is to be fastened, and draw tightly (Sketch 2*b*).

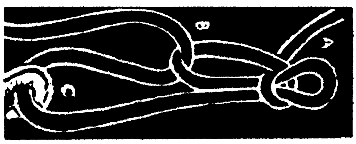
A secure method for handling pipe can be ensured by studying this diagram of the well-pipe hitch.

The hitch is very desirable for handling pipe, because it can be raised or lowered on the pipe without loosening the knot itself in any way, and invariably holds the pipe secure when the load is applied upon the standing part.



It is made by wrapping the end of the rope three or more times below the standing part. Pass the end over and around the standing part and through the opening between the end and the standing part, and draw tightly.

A convenient fastening for a rope used in binding a load is the rope tackle or hay knot. It is the only hitch which will permit the tightening of a binding rope to any degree.



In making the hitch, first form a bight in a rope about twelve or fourteen inches long, and turn a half hitch about the end of the bight with the standing part of the rope. Pass the end of the rope through a convenient ring or hook at the bottom of the hay cart (*c*), through the bight (*b*), thus tightening the standing part of the rope (*a*) over the load.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

DON'T TREAT CHILDREN'S COLDS LIGHTLY.

WE might say there are two kinds of colds; the kind children catch and the kind which catch the children.

The colds they catch are the ones handed on by the careless people and other children who have colds and who sneeze or cough into the atmosphere and do not cover their mouths and noses with a handkerchief.

Using common drinking vessels or kissing on the mouth are equally sure ways of catching colds. So are the crowded rooms and buildings with poor ventilation into which so many children are taken even in winter.

Colds which catch the children seem to be caused by germs already in the throat, ordinarily harmless but ready to go to work once resistance to them is broken down. Sudden chilling, insufficient sleep, too many sweets and cakes and not enough of the protective foods—milk, butter, eggs and fruit—all undermine bodily resistance.

Colds need serious treatment. When a child shows signs of starting a cold—"snuffly" nose, burning eyes, and a prickly feeling in the throat—put him to bed and keep him there until the symptoms subside. Give him a light nourishing diet—milk and milky foods, vegetable broth, fruit drinks and fruit, especially oranges—and plenty of water to drink. A hot bath at night is good provided the child is put straight into warm pyjamas and popped into a warm bed afterwards. The chest may be rubbed with warm camphorated oil or similar preparation, and the child should be propped up on a higher pillow than usual to make it easier for him to breathe and prevent his throat tickling. If the cough is troublesome or the child complains of earache or pains in his head, your doctor should be called. Use only the medicines he prescribes. It is not usual to give medicine to babies or very young children.

Colds can be prevented. Better than treating a cold is preventing it. To do this keep children away from people with colds even if they are members of the family. Do not kiss children on the mouth yourself or allow others to do so. Do not take little children into crowded buildings like picture shows or have them out at night especially in winter time when so many people have colds. Give each child his own cup to drink out of at home and at school and see that cups and spoons are washed in scalding soapy water after use. Clothe children suitably for the weather—keep their feet and legs warm and dry. Wet shoes and stockings should be changed at once. See that they have plenty of play in the fresh air and sunshine and above all give the right kind of food for health.

If your child is always catching cold take him to your doctor or a toddlers' health centre if one is available and have him examined. Most of this advice is good for grown-ups too.

Further advice on this and other matters can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane,* or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Onion Broth.

Mince 6 large onions and fry them in 2 oz. butter for five or six minutes. Add 3 cups white stock and simmer for 45 minutes. Put through a sieve and keep hot. Melt 1 tablespoon butter in a saucepan, add 2 tablespoons flour, cook a little, then add 2 cups hot milk and stir until mixture thickens. Simmer for five minutes, then add onion mixture. Beat 2 egg yolks well with ¼ cup milk, add to soup and season with salt and pepper, and, if liked, a little cayenne. Do not allow soup to boil after yolks are added, but turn into individual earthenware pots. Sprinkle with a little grated cheese and place in hot oven or under griller to melt cheese. Serve at once.

Cream of Spinach.

Cook 1 bunch spinach in the usual way and rub through a fine sieve. Melt 2 level tablespoons butter in a saucepan, add 2 level tablespoons plain flour and cook a little, add 2 cups stock and bring to boil and then simmer for 5 minutes. Now add 2 cups hot milk and spinach, salt and pepper, and if liked a little grated nutmeg. A little cream may be added just before serving.

Three in One Cookies.

Cream ¼ cup butter or 2 dessertspoons each of dripping and butter, ½ cup sugar, pinch of salt, and 1 egg. Beat well. Fold in 1¼ cups of self-raising flour and ½ cup cornflour well sifted together, add vanilla essence to flavour. If too stiff, add a little milk. Divide mixture in three parts.

For kisses, bake in small teaspoons on greased slide and join together with white icing when cold.

For iced cookie, roll in small balls, place on greased slide and flatten with fork. Ice with pink icing when cold.

For jam drops, put teaspoons of mixture on greased slide, make wells in centre with floured finger, and fill with jam (plum or raspberry). Bake in a moderate oven until golden brown. Store in airtight tins.

Orange Fruit Cake.

Quarter cup butter, ½ of a cup of sugar, 1 egg, ⅔ of a cup of orange marmalade, 2 cups flour, 1 teaspoon baking powder, ½ teaspoon carbonate soda, ½ teaspoon spice, ½ cup chopped raisins, ½ cup chopped nuts. Cream butter, add sugar, beat egg, beat together, add marmalade. Sift flour, soda, baking powder, spice, and add to mixture raisins, nuts. Bake in a loaf tin in moderate oven.

Sultana Scones.

Six ounces flour, a pinch of salt, 2 oz. of lard or margarine, 1 teaspoon of baking powder, 1 oz. of castor sugar, 1 oz. of sultanas, 1 gill of milk. Mix the salt, flour, and baking powder and sift them. Rub in the lard, add the sugar and the sultanas free from stalk. Stir in milk to form a dough that is soft but not sticky. Turn it on to a floured board and form into two rounds. Mark each round in four and bake in well-greased sandwich tins in a hot oven 20 to 30 minutes.

Brown Scones.

Eight ounces of wholemeal flour, 1 oz. of dripping, 1 oz. of sugar, 1 teaspoon of cream of tartar, ½ teaspoon of carbonate of soda, ¼ teaspoon of salt, 1 gill of milk. Sieve together the flour, salt, soda, and cream of tartar, and add the sugar. Mix all dry ingredients together and add the milk, stirring all together with a wooden spoon. Turn the mixture on to a floured board, shape it into two round, flat cakes. Put them on a greased baking tin, cut each in four, and bake in a

QUEENSLAND WEATHER IN JUNE.

Over average district rainfall totals in the Peninsula and North Coast Barron areas were mainly due to light daily showers along the coastal fringe. The most useful over average distribution occurred in Lower West and Far South-West where district averages were 106 and 128 points respectively, mainly the result of a rain spell on the 4th and 5th. Light to useful benefits spread east through the Warrego and Downs to the South Coast, but during the rest of the month practically no rain was recorded in the State except on the Tropical Coast, and except for the abovementioned areas all other districts were well below the usual light to moderate seasonal averages. In the wheat-growing and other farming areas of the south-east quarter an additional half inch to inch agricultural rain during July would consolidate the favourable conditions of May. Normal dry weather wintering conditions are being experienced over inland pastoral areas, except for a belt of country which stretches from the Central-Western Border areas, the Central Interior, to the Central Highlands. Many districts in this belt registered only patchy and poor amounts during the summer and commenced the dry season under unfavourable conditions.

Pressure.—A shallow depression in southern Queensland and northern New South Wales connected with another low centre off the south-east coast of New South Wales on the 4th and 5th produced the only rains of the month in southern Queensland. Although there was considerable activity in the low pressure belt over waters south of the Continent, most of Australia was under the influence of a fine weather series of continental "highs," lacking any definite inland trough formations between the systems. As a consequence prevailing south-east winds brought several periods of moderate seas along the Tropic Coast with the usual daily showers in the far north section.

Temperatures.—Maximum temperatures were above normal throughout the State, mostly from 1 to 2 degrees. Minimum temperatures in tropical sections were mostly above normal, but below normal in the Subtropics, up to 4 degrees at Mitchell. Many frosts were experienced in the south-east quarter of the State, especially round the Downs and Maranoa where Bybera had 26 nights under 40 degrees, Stanthorpe 25, Dalby and Warwick 24, and Mitchell and Tambo 21. Low terrestrial minimum readings included 13 degrees at Bybera (29th-30th), 16 degrees at Stanthorpe (30th), and 16 degrees at Mitchell (30th).

Brisbane.—Pressure $\frac{9+3}{2}$ 30.084 inches (normal 30.076 inches). Temperatures—Mean maximum 71.2 degrees (normal 69.3 degrees); mean minimum 49.2 degrees (normal 51.1 degrees); mean temperature 60.2 degrees (normal 60.3 degrees). Highest daily temperature 78.2 degrees on 24th; lowest daily temperature 41.1 degrees on 30th. Rainfall.—29 points on 1 day (average 259 points on 8 days). Sunshine.—265.8 hours (normal 189.3 hours). Record.—Previous highest 261.7 hours in 1946. Frosts (Suburban) 3 nights (normal 2.8).

The rainfall position is summarised below—

Divisions.	Normal Mean.	Mean June, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	58	186	221 above
Peninsula South	45	58	29 ,,
Lower Carpentaria	51	12	76 below
Upper Carpentaria	83	3	96 ,,
North Coast Barron	205	226	10 above
North Coast Herbert	285	237	17 below
Central Coast East	197	22	89 ,,
Central Coast West	130	5	96 ,,
Central Highlands	159	7	96 ,,
Central Lowlands	117	8	93 ,,
Upper Western	67	15	78 ,,
Lower Western	73	106	45 above
South Coast, Port Curtis	251	16	94 below
South Coast, Moreton	297	37	88 ,,
Darling Downs, East	183	65	64 ,,
Darling Downs, West	159	43	73 ,,
Maranoa	158	34	78 ,,
Warrego	134	64	52 ,,
Far South-West	101	128	27 above

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	17	41	Longreach	29	40
6	6.27	5.21	Charleville.. ..	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry	41	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5.28	Dirranbandi ..	21	17	Townsville.. ..	15	35
26	6.10	5.31	Emerald	14	24	Winton	33	47
31	6.04	5.33	Hughenden ..	26	44	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	4.27	5.57
2	5.22	6.40
3	6.17	7.19
4	7.12	7.54
5	8.07	8.27
6	9.01	8.58
7	9.57	9.28
8	10.54	9.59
9	11.54	10.32
10	..	11.09
11	12.57	11.51
	a.m.	p.m.
12	2.03	12.41
13	3.11	1.38
14	4.16	2.44
15	5.17	3.54
16	6.11	5.06
17	6.57	6.15
18	7.38	7.22
19	8.15	8.25
20	8.49	9.26
21	9.22	10.25
22	9.56	11.24
23	10.31	..
		a.m.
24	11.09	12.21
25	11.51	1.18
	p.m.	
26	12.38	2.13
27	1.28	3.05
28	2.21	3.54
29	3.16	4.39
30	4.11	5.19
31	5.06	7.55

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	29	10	44	25	19	0	52	28
6	20	17	36	32	11	8	42	37
11	13	27	28	43	2	18	31	51
16	12	26	27	42	2	18	30	50
21	22	15	38	30	13	6	44	35
26	30	10	45	24	20	0	53	27
31	25	13	41	28	16	3	47	32

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	52	5	60	34	50	20	43	6
3	45	10	61	37	46	23	37	10
5	36	19	55	43	40	28	30	17
7	27	29	48	50	33	35	22	25
9	17	38	41	57	26	42	15	33
11	12	48	38	62	23	48	11	40
13	5	53	35	66	19	51	5	44
15	6	51	35	64	20	50	6	43
17	14	41	39	58	24	44	13	35
19	26	30	47	50	32	35	22	25
21	36	19	55	43	40	28	30	35
23	45	10	61	37	46	23	37	10
25	53	6	67	34	50	20	44	7
27	54	4	67	33	51	19	44	5
20	51	6	65	34	49	20	42	7
31	43	13	59	39	44	24	36	13

Phases of the Moon.—Full Moon, August 2nd, 11.50 a.m.; Last Quarter, August 10th, 6.22 a.m.; New Moon, August 16th, 9.12 p.m.; First Quarter, August 23rd, 10.40 p.m.

On August 15th the Sun will rise and set 16 degrees north of true east and true west respectively, and on August 7th and 20th the moon will rise and set approximately at true east and true west respectively.

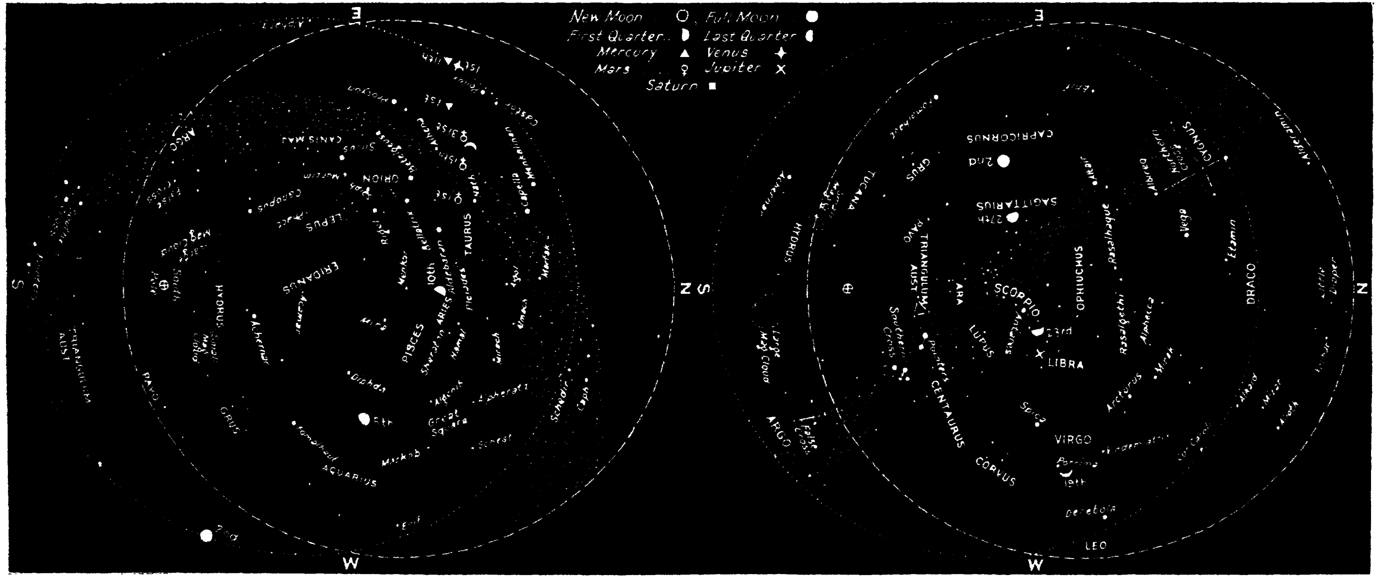
Mercury.—At the beginning of the month, will rise over 1 hour before the Sun and will reach greatest angle west of the Sun on the 3rd. About the 11th, it will be in line with Castor and Pollux, and on the 29th will be at superior conjunction. At the end of the month it will set only 6 minutes after the Sun.

Venus.—At the beginning of August will rise only half an hour before the Sun and by the end of the month will be almost in line with the Sun.

Mars.—In the constellation of Taurus will rise between 3.30 a.m. and 4.30 a.m. at the beginning of the month and by the end of the month, in the constellation of Gemini, it will rise between 2.45 a.m. and 3.45 a.m.

Jupiter.—Still in the constellation of Libra. At the beginning of August, Jupiter will set about one hour after midnight and by the end of the month it will set about one hour before midnight. It will be the only naked-eye planet in the evening sky this month.

Saturn.—Too close in line with the Sun to be seen, being in conjunction with the Sun on the 5th. At the end of the month it may be seen with difficulty, low in the east during morning twilight, when it will rise about 1 hour before the Sun.



Star Charts.—The chart on the right is for 7.15 p.m. in the South-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th August. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 10 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the N.S.W. border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JUNE RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of years' records.	Total Rainfall. June 1946.	Total Rainfall. June 1947.
	In.		In.	In.
North Coast.				
Atherton	1·73	42	0·64	2·45
Cairns	2·89	61	0·74	3·76
Cardwell	2·09	71	0·39	1·33
Cooktown	2·09	67	0·47	1·62
Herberton	1·18	57	0·27	1·41
Ingham	2·49	51	0·09	1·66
Innisfail	7·41	62	1·35	8·71
Mossman	2·97	19	0·74	4·82
Townsville	1·38	72	..	0·17
Central Coast.				
Ayr	1·48	56	..	0·16
Bowen	1·64	72	..	0·24
Charters Towers	1·31	61	..	0·09
Mackay	2·74	72	0·07	1·03
Proserpine	3·22	40	..	1·03
St. Lawrence	2·46	72	..	0·02
South Coast.				
Biggenden	2·16	44	0·06	0·20
Bundaberg	2·79	60	..	0·20
Brisbane Bureau	2·59	95	0·22	0·29
Caboolture	2·74	67	0·17	0·27
Childers	2·40	48	0·07	0·17
Crohamhurst	4·29	50	0·23	0·36
Esk	2·14	56	..	0·41

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of years' records.	Total Rainfall. June. 1946.	Total Rainfall. June. 1947.
	In.		In.	In.
South Coast—cont.				
Gatton College	1·72	44	0·09	0·63
Gayndah	1·82	72	0·02	0·03
Gympie	2·60	73	0·05	0·56
Kilkivan	2·14	62	..	0·42
Maryborough	2·93	72	0·18	0·29
Nambour	3·69	47	0·16	0·31
Nanango	1·95	61	0·06	0·44
Rockhampton	2·51	72	..	0·07
Woodford	2·78	55	0·06	0·33
Darling Downs.				
Dalby	1·63	73	..	0·90
Emu Vale	1·45	47	..	0·44
Jimbour	1·53	64	..	0·64
Miles	1·69	58	0·02	0·20
Stanthorpe	1·88	70	0·20	0·67
Toowoomba	2·33	71	0·06	0·94
Warwick	1·70	78	..	0·58
Maranoa.				
Roma	1·49	69	0·02	0·25
St. George	1·49	62	0·17	0·46
Central Highlands.				
Clermont	1·68	72	..	..
Springsure	1·76	74	..	..

CLIMATOLOGICAL DATA FOR JUNE.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature. Mean Max.	Shade Temperature. Mean Min.	Extremes of Shade Temperature. Max.	Date.	Min.	Date.	Rainfall. Total.	Rainfall. Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Coastal.									
Cairns	..	79	65	84	26	58	19	376	11
Herberton	..	72	54	79	24, 25	42	19	141	8
Townsville	..	78	60	84	26	50	13, 14	17	2
Brisbane	30·11	71	49	78	24	41	30	29	1
Rockhampton	30·13	75	47	82	24, 25	36	20	7	2
Darling Downs.									
Dalby	..	67	36	74	23, 24	28	19	90	1
Stanthorpe	..	61	31	68	23	21	30	67	1
Toowoomba	..	63	40	69	3, 22, 24	32	30	94	1
Mid-Interior.									
Georgetown	30·03	85	56	89	25	43	14	Nil	..
Longreach	30·16	79	47	87	24	41	6, 20	20	1
Mitchell	30·21	68	34	79	23	25	30	42	1
Western.									
Burketown	..	84	57	91	26	50	14	14	2
Boulia	30·11	75	47	85	22, 26	36	30	44	1
Thargomindah	30·15	67	44	79	22, 23	36	28	79	1

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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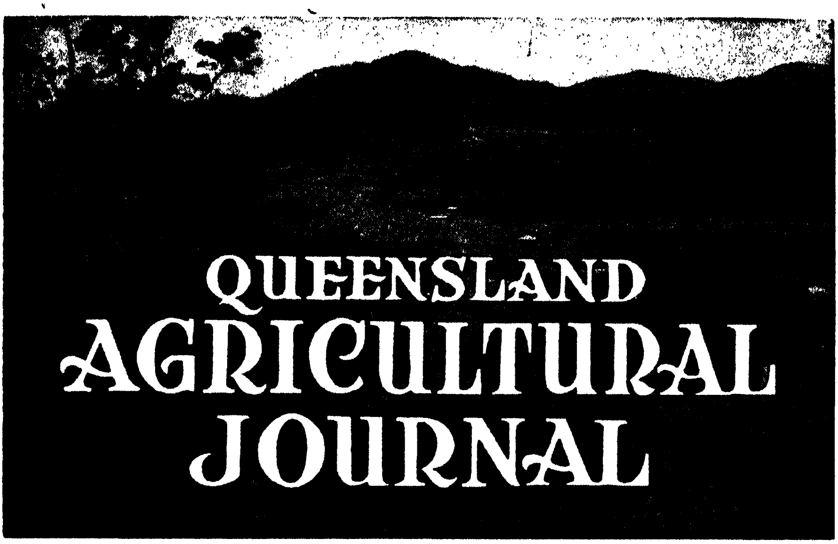
Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



Volume 65 — 1 AUGUST, 1947 — Part 2

Event and Comment.

Supplementary Feeding of Stock.

WHEN supplementary feeding of stock becomes necessary, the use of concentrated foodstuffs—such as grain or compressed meals—rather than bulky fodders, unless they can be grown on the property, is sound practice. While it may not be practicable to provide for the supplementary feeding of whole herds or flocks, it is certainly advisable to provide for a sufficient reserve of concentrates to cover the maintenance of at least the best of the breeding stock.

In the dairying branch of animal industry, circumstances are somewhat different, for it is practicable for dairy farmers to overcome, in some degree, seasonal influences by the cultivation of a balanced acreage in relation to the number of stock carried to enable enough farm-grown feeds to be conserved in the form of silage, hay, and grain to meet supplementary feeding requirements. Overmuch reliance is often placed on pastures alone with little thought to the conservation of surplus growth, with the inevitable result of serious seasonal fluctuations in production.

While the need of conserving fodder is widely recognized, unfortunately it has not yet become a general practice. An ideal system is one which combines fodder conservation with pasture management and the cultivation of fodder crops. A general aim should be the growth and storage of enough feed to maintain the milking herd in production for at least six months. This is really necessary if the recurring annual decline in output during the winter and spring months, when pastures are either dormant or dried out, is to be checked.

In Queensland, climatic conditions are generally conducive to the growth of a summer range of useful fodder crops, particularly maize and sorghum. With silage making on a sound basis, the storage of hay or grain for use with it to provide a correct balance should be regarded as a regular farm routine.

New Harvesting Machinery.

Something more than elementary knowledge is needed for the essential requirements of the dairy cow. While there is a spreading interest in the growing of greens and grains and in the better feeding of milking herds, the number of dairy farmers who systematically conserve silage for use with hay and grain during the dry period of the year is not large. There are, of course, limiting factors in respect of fodder conservation. Labour shortage, not lack of finance is, perhaps, the major factor. The answer is mechanization, the use of complete harvesting equipment of high capacity designed to deal with bulky crops at a cost much below that of ordinary methods. This particular factor has engaged the attention of agricultural engineers in Britain and America, who have evolved "one man harvesting units" designed specifically for the purpose of solving the labour problem. Two such types of machines have been brought to Queensland and are now in operation. One is the Ensilage Harvester, which harvests standing row crops, such as maize and sorghum, chaffs them in one go at an hourly rate of 8 to 10 tons; the other is the Automatic Pick-up Hay Baler, which is capable of turning out from 250 to 300 bales of hay an hour. The possibilities of such machines in fodder conservation practice will be readily appreciated. Obviously, their purchase and operation would be beyond the means of many farmers with average-sized dairying properties, but group purchase and usage on a co-operative or contract basis might get over that difficulty. There is evidence of the practicability of that idea in some localities in the State in which co-operatively owned harvesting outfits are already working successfully.

Storage of Home-grown Fodder.

It is generally agreed that equipment and storage for home-grown fodders should be regarded as an ordinary dairy farm necessity. For the storage of green fodder as silage, several types of silos, ranging from the inexpensive trench to the permanent and more costly concrete-lined pit or tower structure, are well known. For the trench type, only labour cost is involved, plus a small amount for maintenance; while with other types the first outlay is the only cost incurred and the silo, therefore, should not be regarded as an expensive farm improvement when its permanence and usefulness are taken into account. A trench silo can be constructed for an outlay of less than 5s. a ton capacity; the costs of concrete pit and tower silos may range from 20s. to 40s. a ton capacity. In the construction of silos, practical and advisory assistance is available from the Department of Agriculture and Stock.

The conservation of fodder and the balanced feeding of stock are absorbing subjects of which there is always something fresh to learn and through which all engaged in stock raising, dairy farmers particularly, may directly benefit. Farmers interested may obtain any information desired from the district adviser in agriculture, or by communicating with the Department of Agriculture and Stock, Brisbane.

Progress in Wheat Breeding, 1946-47.

R. E. SOUTTER, Plant Breeder, Agriculture Branch.

THE drought conditions of the 1946 season in Queensland drastically reduced the State's wheat production and seriously curtailed the winter cereal breeding programme of the Department. It was possible eventually to plant only two observation plots, one at Hermitage Regional Experiment Station, near Warwick, and the other at the Queensland Agricultural High School and College, Lawes.

The first sowing at Hermitage was made in August, but because of poor and irregular germination the plot was ploughed out and replanted during the first week in October. Notwithstanding the fact that this sowing was made unseasonably late, giving little promise of success, the more disease-resistant strains succeeded in producing useful yields of good quality grain.

The site at the College was chosen because of the availability of water for irrigation. This enabled the plot to be sown without rain, and to be watered judiciously during the growth of the crop. Planting was carried out in early August and harvesting occurred during November. The outbreak of stem rust at this centre during the warm ripening period was more severe than at Hermitage, though at both sites the older rust-susceptible varieties were very seriously affected. As the College plot was the more seasonal in growing period, in addition to being the more heavily rust infected, it has been used to provide the data and illustrative material which follow.

Material Tested.

The observation plots are representative of a series which are normally replicated at some four or five centres throughout the State. They each comprised approximately 200 rows, 30 to 40 of which represented named varieties and the remainder fixed crossbred selections from the current Queensland wheat breeding programme. The named varieties included all the standard Queensland varieties, in addition to a number of recent introductions from the southern Australian States.

The majority of the local varieties were Queensland bred, and while they have in the past shown their ability to withstand adverse

weather conditions they have never been claimed to be rust-resistant; they have frequently been able to escape rust, however, when sown at the main planting period. Others in this group represent old introductions such as Pusa 4 and Gluyas, which have for many years played a prominent part in Queensland's wheat culture. A number of the new introductions, particularly those from New South Wales, have been specifically bred for resistance to stem rust and have maintained their resistance under local conditions during the past few years of trial. The great majority of the newer Queensland hybrids have also been bred for rust resistance, in addition to yield and milling quality, and have proved highly resistant in field tests during recent seasons.

In the following tables, a comparison is made between 14 introduced varieties (including the rust-resistant Celebration, Charter, Gabo, Kendee, Yalta and Hofed) and 14 Queensland productions, comprising three older named varieties and 11 new crossbreds.

Stem rust and leaf rust reaction have been computed on the basis of a scale from 0-6. A reading of 0 indicates a complete absence of rust pustules, whlie 6 represents the maximum possible coverage of rust.

As yields have been based on single rows 33 ft. in length and 1 ft. 6 in. apart, from the plot at Lawes, no great weight should be attached to the figures. It is considered, however, that these yields do indicate very marked differences in the reaction of the varieties and hybrid samples to the searching conditions of the season experienced. Bushel weights were determined by chondrometer test, but in the case of the lower-yielding varieties this figure was unobtainable on account of insufficiency of grain.

In the accompanying illustrations (Plates 28 to 34) grain samples of the 28 varieties and strains included in Tables 1 and 2 are depicted. In each plate the top samples represent introduced varieties (cf. Table 1), and the lower two are from Queensland-bred varieties and strains (cf. Table 2).

TABLE 1.

DATA ON INTRODUCED VARIETIES. WHEAT OBSERVATION PLOT. LAWES, 1946.

Variety or Strain.	Stem Rust.	Leaf Rust.	Computed Yield per Acre.	Appearance of Grain.	Bushel Weight.
			Bushels		Lb.
Charter	0	2	27·5	Good	61
Gabo.	0	1	21·5	Pinched	58½
Kendee	1	2	21·0	"	59
Pusa 4	5	4	13·7	Very pinched	..
Warigo	3	2	12·8	" "	..
Gular	4	3	11·9	" "	..
Celebration	0	2	11·0	Pinched	..
Yalta	Trace	3	11·0	"	..
Eureka	4	3	10·0	Very pinched	..
Hofed	2	1	10·0	Pinched	..
Insignia	5	4	9·1	Very pinched	..
Gluyas	4	3	7·3	" "	..
Currawa	4	2	2·7	" "	..
Ford	5	4	2·7	" "	..

TABLE 2.

DATA ON QUEENSLAND-BRED VARIETIES AND HYBRID SELECTIONS. WHEAT OBSERVATION PLOT. LAWES, 1946.

Variety or Strain.	Stem Rust.	Leaf Rust.	Computed Yield per Acre.	Appearance of Grain.	Bushel Weight.
			Bushels		Lb.
K54P4–4608	0	4	32·0	Very Good	64¼
K54P4–4625	0	4	31·1	,, ,,	64¼
KGPF–4613	0	3	31·1	Good	65¼
PHarv–4607	0	3	30·2	,,	64½
KGPF–4521	0	3	28·4	,,	65¼
KGPF–4676	0	2	28·4	,,	65
SFPFHS.4607	0	1	28·4	Fairly good (*Red*)	60¼
KGPF–4655	0	3	27·5	Good	64¾
Wheat Rye 4601	2	1	26·5	,,	61¾
KGPF–4672	0	3	25·6	,,	63
KGPF–4508	0	2	24·7	,,	64¾
Seafoam	5	4	18·3	Slightly pinched	..
Puglu	4	3	14·6	Pinched	..
Flora	3	4	7·3	Very pinched	..

Rust observations made by Mr. R. B. Morwood and Mr. D. Rosser.

Discussion.

Comparisons of the varieties and strains within the two tables show some startling differences in the calculated yield per acre. While it is reiterated here that these figures cannot be accepted as representing accurate comparative yields under field conditions, it is still held that they do indicate marked differences in the ability of these strains to produce grain under seasonal conditions, which have been mainly dry and yet conducive to rust.

A study of the illustrations depicting grain samples from the 28 strains reveals differences in kernel plumpness which are no less startling than those in yield. One of the most extreme contrasts is afforded in Plate 32, where Currawa and Eureka are shown alongside two new crossbreds of the parentage Kenya Governor x (Pusa Flora).

It is obvious from inspection of the tables and illustrations that certain general relationships hold; and one of the most important of these is that, in both groups, the strains which were immune or highly resistant to stem rust have also proved highest in yield and highest in bushel weight. Moreover, they have provided the plumpest and most attractive grain samples. This relationship is to be expected in a season in which stem rust is prevalent, and shows the importance of breeding rust-resistant varieties for districts in which such seasons are likely to be often encountered. Those varieties showing apparent immunity to stem rust were Charter, Gabo, and Celebration, amongst the introductions from the South, and all the new Queensland crossbreds except Wheat x Rye-4601. Others showing but a trace of stem rust were Kendee and Yalta from New South Wales, while Hofed (N.S.W.) and the wheat-rye cross showed moderately low readings also. All other varieties, whether introduced or local, gave values ranging from 3 (intermediate) to 5 (bad).

Leaf rust infestations, ranging from 1 to 4, indicate a fair degree of resistance in some of the new varieties and strains. This disease, however, appears to have little effect in Queensland upon either yield or kernel plumpness (as can be seen from the previous tables) and, therefore, has not been viewed with great concern.

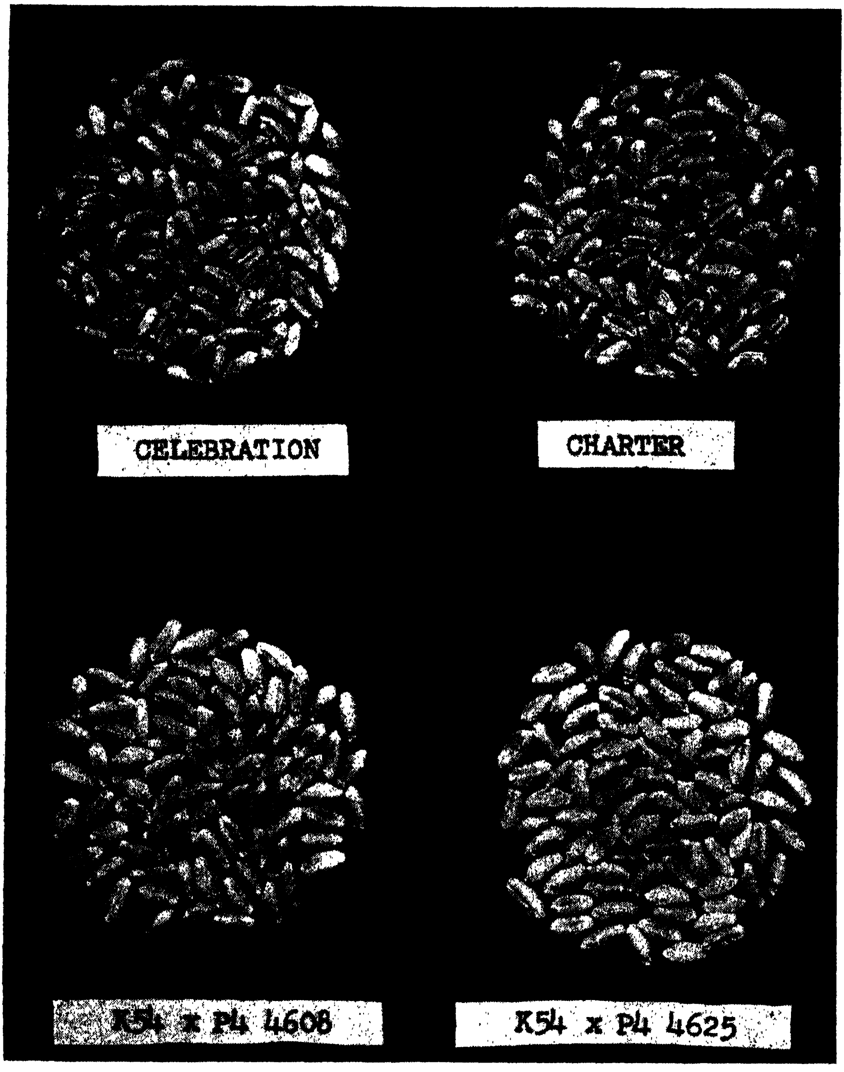


Plate 28.

One other important feature which does emerge from the tables and illustrations is that although all plump grain samples came from rust-resistant plants, not all rust-resistant plants have produced plump grain (or for that matter, high yields). Among the strains which are rust resistant and at the same time plump-kernelled, may be classed the two

K54 x P4 selections and Charter, illustrated in Plate 28. The other variety shown in this plate, Celebration, is equally rust resistant, but has produced pinched kernels and a considerably lower yield. Other varieties which, in spite of their rust resistance, have yielded pinched grain are Gabo, Kendee and Yalta. Conversely, Puglu (Plate 31), though

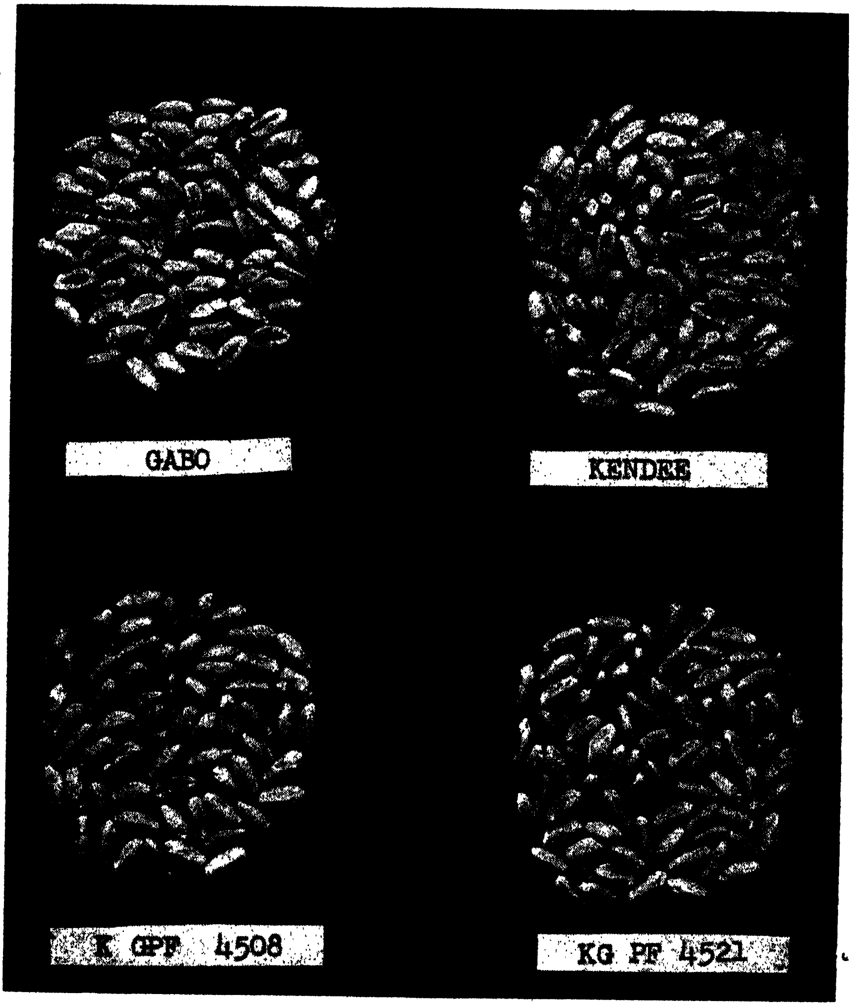


Plate 29

fairly heavily rusted in the field, yielded a grain sample which is no more pinched than that of Kendee, Celebration or some of the other highly resistant varieties from New South Wales. Incidentally, its appearance in this respect is rather better than that of either parent, Pusa 4 or Gluyas, and provides a reason for this variety's popularity in Queensland.

These comparisons suggest that the locally bred wheats possess something, undoubtedly associated with drought resistance, which renders them better adapted to extremes of seasonal conditions likely to be encountered in Queensland. Such a result is, of course, only to be expected, as it is a well-known plant breeder's maxim that breeding work is always best carried out in the particular district which it is intended to benefit. The only southern variety which approached the best of the Queensland crossbreds in yield, bushel weight, and appearance of the grain was the New South Wales variety, Charter. This test confirms the good opinion held of this variety as the result of previous trials over a three- or four-year period. The other rust-resistant introductions may yield very well in Queensland during a milder season, but appear to have been somewhat out of their environment in the hot dry spring weather experienced.

A number of the new hybrid selections, particularly those from the crosses K54 x P4, and KG x PF, have shown real promise and will go into replicated plot tests in the 1947-48 season. Under the admittedly artificial conditions of this test they have combined immunity to stem rust with good yields, high bushel weight, and attractive grain appearance. Critical tests for yield and bread-making quality are necessary before such strains can be named and liberated to farmers as improved varieties.

Description of Varieties and Strains.

Following are brief descriptions of the varieties and crossbred strains included in the test:—

Celebration (Plate 28).

(Double cross x Dundee) x Dundee, made at Glen Innes in New South Wales by Dr. S. L. Macindoe. It is a very recent liberation of about the same season as "Ford" and has been recommended for replacing that variety in localities where rust infestation is likely. It is claimed to be highly resistant to stem rust. In the tests under observation it proved to be definitely less susceptible than the varieties in general cultivation, producing a grain similar to though not equal to that of Charter.

Charter (Plate 28).

Derived from a Kenya x Gular cross made by Dr. S. L. Macindoe at Glen Innes. This is the most promising general purpose variety for Queensland conditions that has so far been introduced from any of the southern States. It is a medium-tall, mid-early wheat, which tends to lodge when yields are heavy. It is highly resistant to stem rust but moderately susceptible to leaf rust. The grain of this attractive variety finishes well and does not mottle as readily as Eureka.

Gabo (Plate 29).

One of the outstanding rust-resisting wheats produced by Drs. W. L. Waterhouse and I. A. Watson of Sydney University, resulting from a cross (Bobin sel. x Gaza) x Bobin sel. In New South Wales it is an early variety, particularly suited for later sowing. It is claimed

to be highly resistant to the known races of stem and leaf rust and this claim is borne out by limited experience in Queensland. Straw is short and of good strength and stooling is stated to be good for an early variety.

In the 1946 trials this variety did not compare favourably with either "Charter" or the best of the local crossbreds in yield and kernel plumpness.

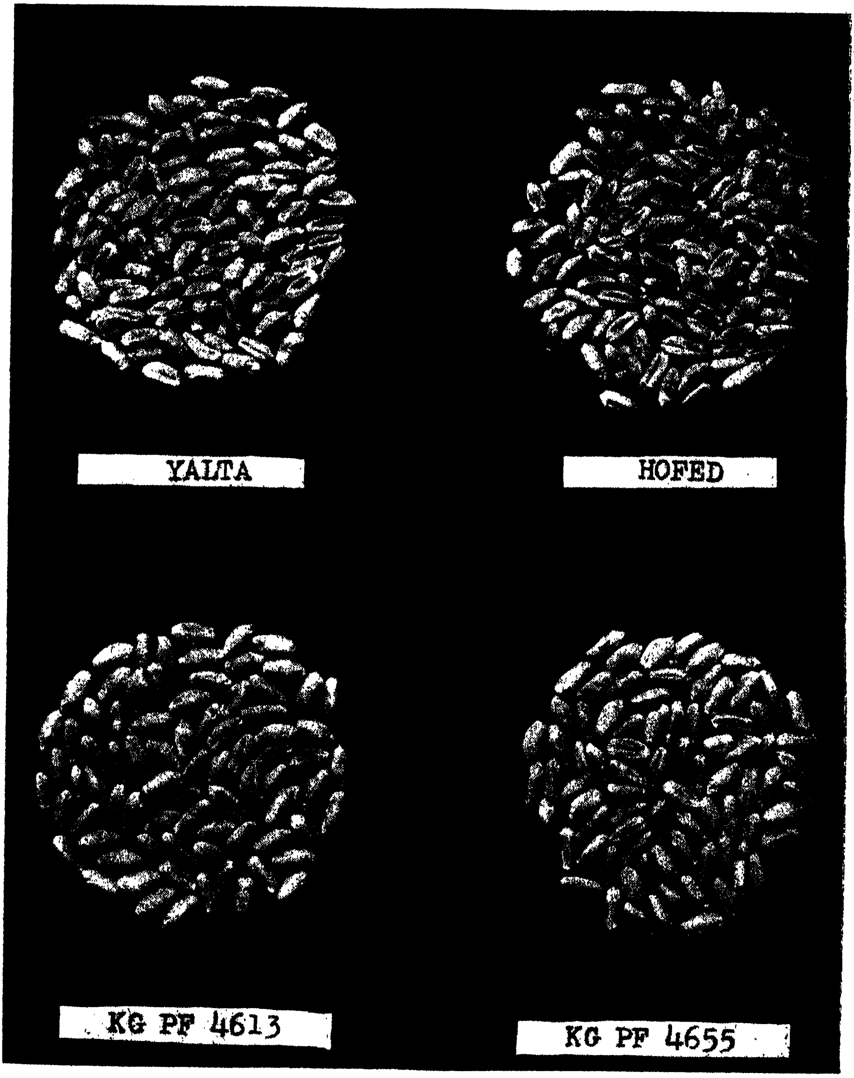


Plate 30.

Kendee (Plate 29).

Parentage Dundee x Kenya (U.A., No. 745). Evolved by Drs. W. L. Waterhouse and I. A. Watson at Sydney University. A mid-season variety suitable for sowing as a main crop in New South

Wales. Straw medium-tall, strong. Does not shatter. Yielding capacity high. It is reputed to be highly resistant to the Australian forms of stem rust but is susceptible to leaf rust. Grain obtained was slightly pinched but with a higher bushel weight than "Gabo."

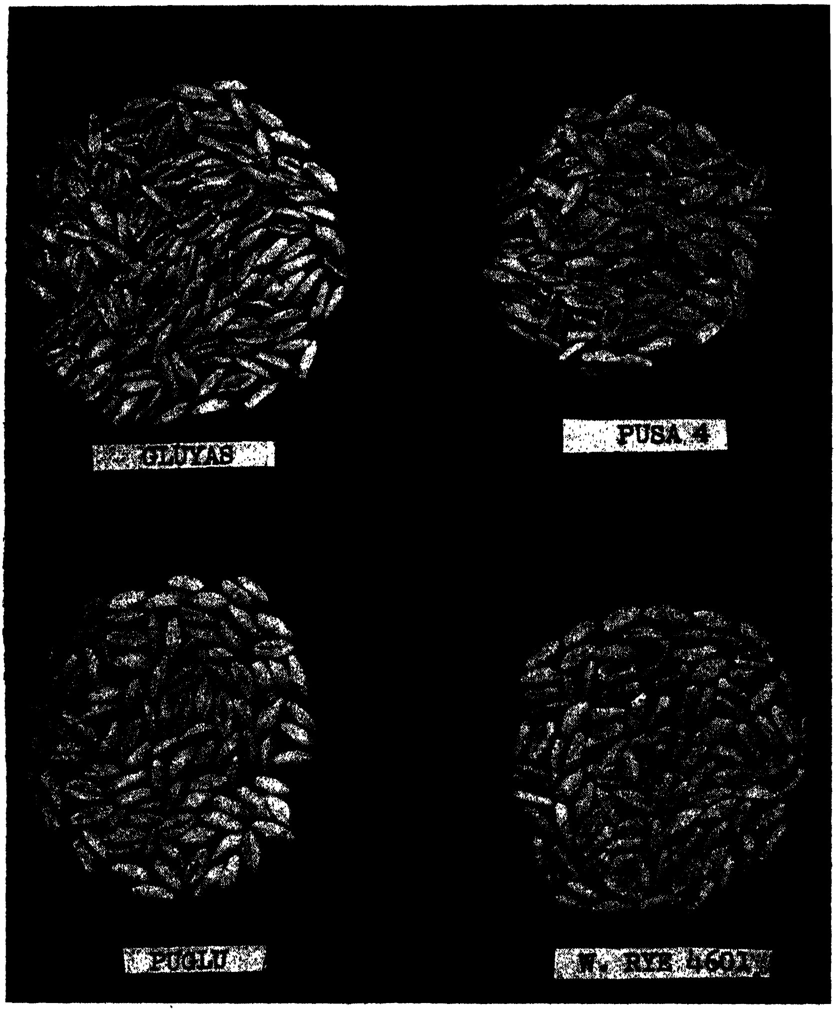


Plate 31.

Yalta (Plate 30).

Evolved at Glen Innes from the cross Kenya x Pusa 4 x Dundee. Another recent introduction to Queensland, this mid-season variety might prove suitable for main crop sowing. Straw medium-tall, strong, with pubescent chaff; grain rather small, dark amber colour, and under favourable conditions plump. It is classed in New South Wales as highly resistant to stem rust but susceptible to leaf rust. These reactions were maintained in the test under review, only a slight trace of stem rust being evident late in the season. Yield was mediocre and the grain pinched.

Hofed (Plate 30).

Produced at Sydney University by Dr. W. L. Waterhouse as a result of crossing Hope and Federation. Medium-late maturing variety, with fine straw which tillers well. This variety has been in general cultivation for a considerable time, and has proved resistant (though not immune) to stem rust, but it has never come into favour with Queensland growers.

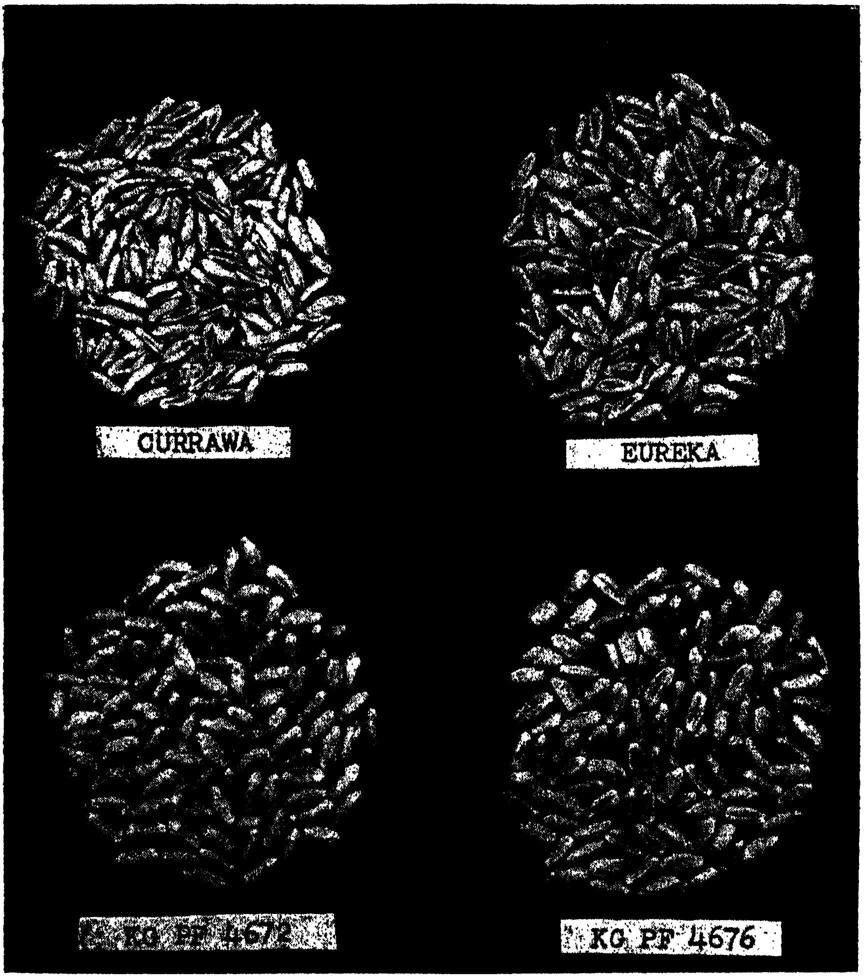


Plate 32.

Gluyas (Plate 31).

Selected in 1894 by Mr. H. J. Gluyas at Port Germain in South Australia, this ultimately became one of the most important wheats in Australia. An old favourite with Queensland growers because of its capacity to give high yields on all types of soil under adverse weather conditions. It is practically the only variety of thirty-five years ago still

being grown. Had it not been for the development of the reaper-harvester it would have gone out of cultivation because of its tendency to lodge. The acreage under this wheat has steadily decreased with the introduction of more suitable varieties. Gluyas blood enters into the breeding of many wheats which have been and are still being grown successfully in Australia, included amongst which are Nabawa, Bencubbin, Gluclub, and Puglu, the last being the second best favoured variety in this State. Because of its susceptibility to rust and the poor quality of the flour, Gluyas is not now recommended.

Pusa 4 (Plate 31).

Parentage unknown. Discovered at the Imperial Economic Botanical Quarters, Pusa, India.

Introduced to Queensland about 1920 and was the leading variety in 1929-30 but has now receded to twelfth place. Because of its exceptionally high quality it has entered largely into the breeding programme of this State, the varieties Puglu, Puno, Puora, Puseas, and Warput having it for a parent.

Currawa (Plate 32).

Resulting from a cross made by Mr. H. Pye at Dookie Agricultural College and named in 1910. At one period it was the second leading variety in Victoria and occupied fourth position in New South Wales. Has been for a very considerable period the best favoured variety for early sowing for grazing purposes in this State, as it is a late variety which, when sown early, produces a large amount of foliage very palatable to stock. Grain is normally soft white, producing a flour of weak quality. It is fairly drought resistant, and although reputed to possess some resistance to stem rust it succumbed to the disease in this trial, producing a poor yield of very pinched grain.

Eureka (Plate 32).

A selection from material obtained as a result of crossing Kenya x Florence x Dundee made by Dr. S. L. Macindoe in 1932 and named in 1938. It is an early mid-season variety, susceptible in Queensland to stem and leaf rust but resistant to bunt.

Straw of good strength. Capable of producing high yields on most wheat soils but because of its susceptibility to local forms of stem rust, and its tendency to produce mottled grain, it is going out of favour in Queensland.

Ford (Plate 33).

Parentage (Fan x Comeback) x (Zealand x Tardent's Blue). Cross made at Roseworthy Agricultural College by Mr. W. J. Spafford and selected from the resulting progeny by Mr. R. C. Scott, named in 1916. It is a medium-late maturing, medium-strong, tall-strawed variety, with long, lax, tapering ear. Grain soft, white, opaque, and plump; gluten medium strong. It is susceptible to stem rust, as the illustration of grain of this variety indicates.

Ford was the third leading variety in Australia in 1935. It is sown for grain and grazing purposes in this State but is not as drought-resistant as some of the earlier maturing varieties from Queensland and New South Wales.

Gular (Plate 33).

Resulting from a cross made in 1911 at Cowra Experiment Farm, New South Wales, and named in 1927.

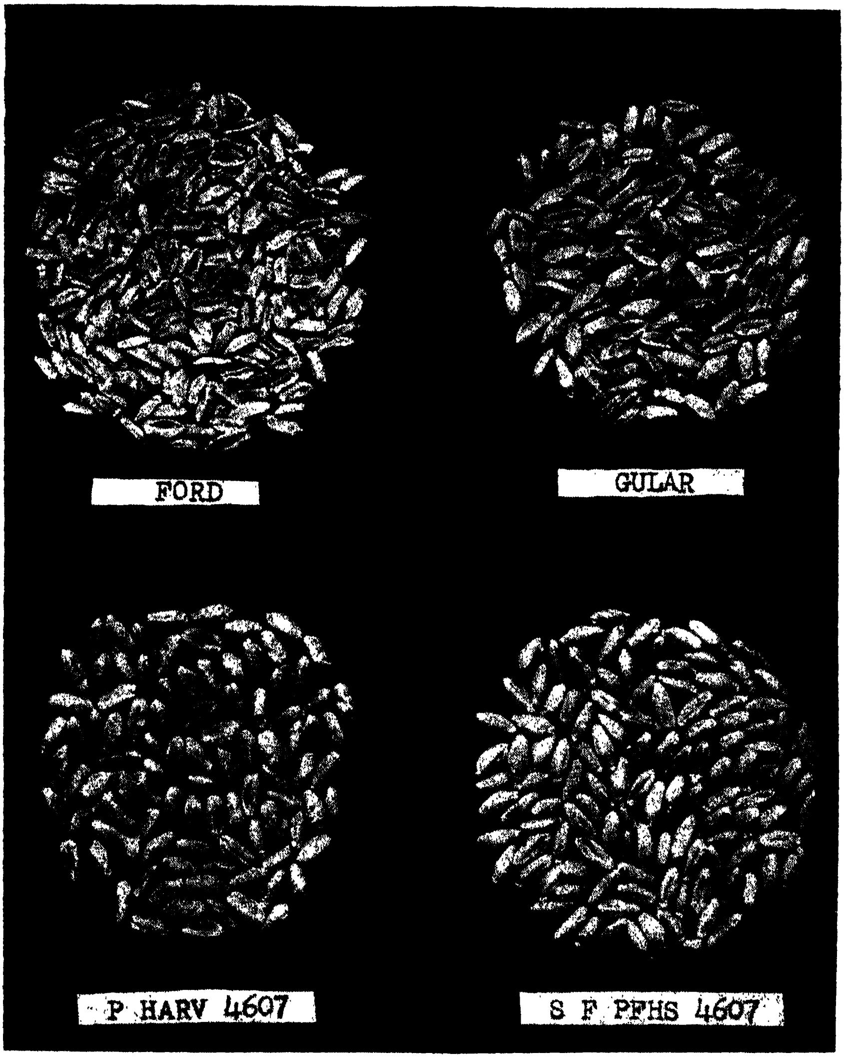


Plate 33.

Early maturing; erect habit of growth; straw medium-tall, medium-strong; tillering poor. Grain white, translucent, producing a flour of very good baking quality. Early, drought-resistant, but is susceptible to stem rust. Gular is one of the parents of the promising recent introduction, Charter.

Insignia (Plate 34).

Selected at Mallee Research Station, Victoria, from material resulting from crossing Ghurka x Ranee. An early maturing variety with characters of both parents. It is not recommended for growing in this State, chiefly because of its susceptibility to injury by stem rust.

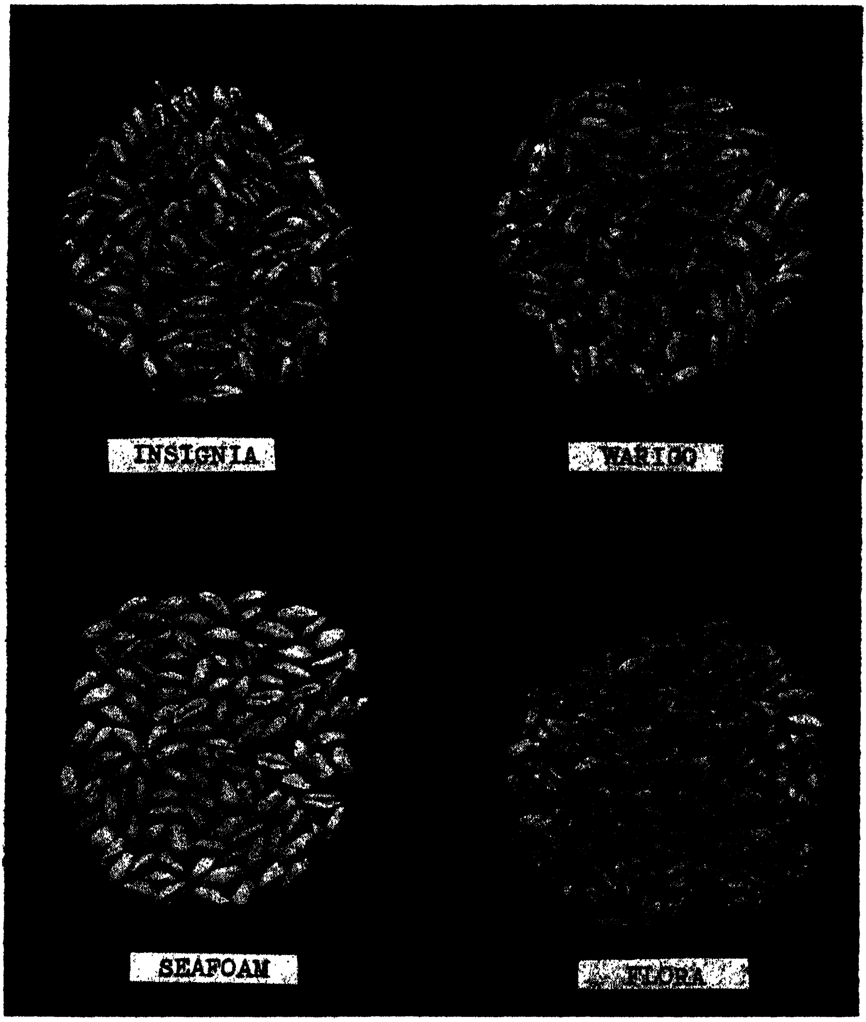


Plate 34.

Warigo (Plate 34).

Selected at Waite Institute, South Australia, by Dr. I. F. Phipps and Mr. S. R. Hockley from segregates from a Nabawa x Hope cross made in 1931. A mid-season variety with medium-fine, tall, strong straw. Grain of medium size, producing strong flour of exceptional dough stability. Some resistance to leaf and stem rust. Because of this and the fact that the variety has high resistance to mildew it has been used

in crossing operations. This variety does not appear to be well adapted to local conditions and it is unlikely that it will ever be extensively grown in Queensland.

K54 P4-4608 and 4625 (Plate 28).

Two promising new selections from the cross Kenya 10854 x Pusa 4 which have so far appeared immune to stem rust though moderately susceptible to leaf rust. These selections, in addition to two others from the same cross, have proved early maturing and prolific both at Hermitage and Lawes, producing plump samples of grain of somewhat better appearance than that produced by Charter. All have pubescent glumes like their Pusa 4 parent.

KG. PF-4613, -4521, -4676, -4655, -4672, and 4508 (Plates 29, 30, and 32).

These selections, placed in order of their yield in the trial, are all segregates from a cross between Kenya Governor and Pusa x Flora —3202. None of them has shown any trace of stem rust in the season's trials but appear to be moderately susceptible to leaf rust; all are bearded. These selections collectively yielded better under nursery-row conditions than all the named varieties except Charter and provided higher bushel weight than any such variety. In grain appearance they were the equal in every case of Charter.

Puglu (Plate 31).

A selection from Pusa 4 x Gluyas made about 1928. Although this variety was never liberated officially it is now second favourite with growers in this State on account of its appearance in the field and its proven ability to yield. Because of the relatively poor quality of its gluten it is not favoured by millers.

Wheat x Rye 4601 (Plate 31).

Resulting from a cross between Kenya Governor wheat and an unknown rye, made in 1935. One seed was obtained from the resulting plant. The probability is that it was the result of cross-pollination. The cross was made originally with the object of ascertaining whether the frost resistance of the rye plant could be incorporated in a segregate having desirable wheat characters as well. Because of the closure of the Roma State Farm in 1935 the facilities for completing this line of research have not been available.

Evidently, some of the rust resistance of the Kenya parent enters into its composition as well as that of two other segregates under observation for, as will be observed, it has produced a good yield of grain of pleasing appearance under conditions which sadly impaired the appearance of the grain of the susceptible varieties of wheat in general cultivation. Next season it is intended to have the grain submitted to a milling test to ascertain if it varies in any respect from the flour obtained from ordinary wheat.

P. Harv. 4607 (Post Harvest) (Plate 33).

This is one of a number of selections made in 1940 of plants which still remained standing in the breeding plots subsequent to a heavy storm which followed the period of general harvesting. From its appearance,

its stem-rust resistance, and the fact that it has pubescent glumes, it is evidently a segregate with Kenya and Pusa 4 blood in its make-up. The grain it produced this season, as will be seen by the table, was of high bushel weight and yield.

SF. PFHS.-4607 (Plate 33).

A selection from a multiple cross involving Seafoam (twice), Pusa 4, Flora, and Hope. This strain is not as promising as some of the others illustrated but has been included because its rust resistance is based upon Hope, as opposed to one of the Kenya varieties. From this parent it has apparently inherited its immunity to stem rust and considerable resistance to leaf rust.

Seafoam (Plate 34).

This variety has the same parentage as Three Seas, being derived from the back-cross Comeback x Cretan x Comeback, and is very similar to Three Seas in all respects. Named in 1930 it is a very early, bearded wheat, which has found favour with growers both on the Darling Downs and elsewhere in the State. It produces a medium strong flour of good baking quality. Though it has in the past been considered to possess some rust resistance, recent tests do not support this view; it has, however, generally proved to be rust escaping and productive of a well-finished grain sample. It has suffered rather severely in this test and does not bear comparison with Charter or the new Queensland hybrids.

Flora (Plate 34).

An older Queensland variety derived from the cross Bobs x Florence, made in 1911. Selection was made in 1919 and the name given later. It is a bald, early variety, and was the leading variety in this State in 1937, 1938, 1939, and 1940, but had receded to sixth position by 1945. It has always proved susceptible to stem rust, though frequently rust-escaping. Under better conditions this variety produces a shotty grain of attractive appearance, which yields a flour of medium-strong to strong class. Flora is one of the parents of Puora, which is now the leading Queensland variety.

Plate 35.

SHOWING THE METTLE OF THEIR PASTURES.—**Brood Draught Mares and Foals on Paradise Downs, Blackall, Western Queensland.**

Notes on Weed Control.

C. W. WINDERS, Agrostologist.

"HORMONE" WEEDKILLERS.

IN 1946 a new type of weedkiller which was developed overseas during the war years became available in Australia. Tests carried out over the past year or so have shown that this new type of weedkiller is effective against quite a number of the weeds commonly encountered in Queensland and that it is very likely to be useful in controlling some of our worst weed pests.

Effects on Plants.

Hormones occur naturally in very small quantities in plants, where they have the effect of regulating the growth processes. When the amount of hormone is increased considerably by spraying or dusting on a synthetic hormone, the growth processes are upset and in many cases the plant dies. However, the effect on the plant varies with growing conditions and stage of growth, and a plant which is killed at one period may not be permanently affected if treated at a different time. For this reason a good deal of investigational work will be necessary before definite recommendations can be made for the eradication or control of many of our weeds.

Grasses and cereal crops are highly resistant to damage by hormone weedkillers at all stages of growth. While this rules out these weedkillers for use against weedy grasses such as Johnson grass and crowsfoot, it enables them to be used in growing cereal crops against broad-leaved weeds such as wild turnips, star burr, and convolvulus.

Method of Application.

The hormone weedkillers marketed in Australia are intended for application as sprays and any type of spraying equipment can be used. The important thing in spraying is to put on a particular amount of the hormone. For some weeds this will be as low as 1 lb. of the hormone per acre; a good many are killed by 2 lb. per acre; and some will require 3 lb. per acre. Repeat sprayings will be necessary for certain weeds.

It is desirable that the weeds be well covered with the spray solution. Depending on the amount of leaf surface, this will take from 80 gallons to 200 gallons of spray per acre, but in most cases 100-130 gallons should be ample. Since spraying when the weed is young and growing vigorously gives best results, there should be no need for the use of large quantities of spray solution.

Precautions to be Taken.

As the hormones and the liquids or other carriers in which they are normally made up are not harmful to humans or stock, there is no hazard to health in using these weedkillers. There is, however, some danger to crop plants and ornamentals, other than cereals, sugar cane, and grasses, and for this reason the direct application of the weedkillers to such plants, and even the drifting of the spray in the wind, should be avoided. Further, the spray equipment after use should

be thoroughly cleansed with washing soda or as recommended by the manufacturers of the weedicides, since any hormone left in the equipment may harm economic plants sprayed subsequently with an insecticide or fungicide.

Tentative Recommendations.

Pending further testing of the various hormone products, the following recommendations are made for the use of those available in Queensland. It must be borne in mind by users that, as already stated, results vary somewhat from time to time. The weeds listed here have, however, been shown to be susceptible to damage and many have been killed quite readily. In many cases, there is no obvious immediate effect shown by the weed, but within a few weeks it shows abnormal growth and eventually dies.

Star Burr:

This serious pest of northern areas is now spreading into southern Queensland. It is readily killed at all stages by 2 lb. of hormone per acre, and in some instances 1 lb. has proved effective.

Blue-top, Billy-goat Weed or Ageratum:

In some sprayings this widespread weed has been readily killed by 1-2 lb. of hormone per acre, but sometimes when late-sprayed it has developed adventitious roots on the stems and persisted for a time.

Khaki Weed:

This is readily killed by 2 lb. of hormone per acre.

Needle Burr:

If sprayed at the rate of 2 lb. of hormone per acre while still carrying its leaves, this plant is killed, though somewhat slowly. If sprayed after shedding its leaves the weed persists.

Cobbler's Pegs:

This widespread annual is usually killed by 1-2 lb. of hormone per acre.

Bindweeds:

The troublesome bindweeds of the Darling Downs, which have in the past been extremely difficult to control, are readily injured by hormone weedkillers. A high proportion of some infestations has been killed by an application of 1 lb. per acre, but with a weed of the nature of bindweed more than one spraying must be expected for a complete kill. Experience to date is that the bindweeds can be controlled and probably eradicated by fairly light applications.

Thornapple, Stramonium or False Castor Oil:

The thornapple which was abundant on the western Darling Downs in 1936-37 was, in the one experiment so far carried out in Queensland, readily killed in all stages by 2 lb. of hormone per acre.

Water Hyacinth:

This aquatic plant is easily killed by hormone weedkillers at 1-2 lb. of hormone per acre.

Pigweed:

This cosmopolitan weed is usually killed by 1-2 lb. of hormone per acre, but at times it is quite persistent.

Turnip Weeds:

The various turnip weeds are especially susceptible to hormone weedkillers, and if attacked in the rosette stage can probably be controlled in the wheat crop with 1 lb. of hormone per acre.

Wild Mint:

Applications as low as 1 lb. of hormone per acre are effective against wild mint.

Noogoora Burr and Bathurst Burr:

Both of these important burrs are easily killed by 2 lb. of hormone per acre, and at times by as little as 1 lb. per acre.

Miscellaneous Weeds:

The weeds listed above are the main pests for which recommendations can be made with some degree of confidence. There are quite a number of minor pests which are readily controlled by hormone weedkillers. These include swinecress, various thistles, Shepherd's purse, rattlepods, cudweeds and ragweeds, bellvine, lambstongue, wireweed, true castor-oil plant, Devil's needles, and stinking Roger. Promising results have also been obtained on lantana, weir vine, wild sunflower, groundsel bush, and nut grass.

Intermediate and Resistant Weeds.

Quite a number of the weeds against which the hormone weedkillers have been tested were killed or severely damaged in their early stages of growth, but were resistant when old. The various wild cottons are in this class, also verbenas, sidas, docks, and oxalis. Possibly an effective method of treatment for these weeds will be determined in time, but at the moment no suggestions for farm treatment will be given.

As already stated, the various weedy grasses are not obviously affected by hormone weedkillers, nor have these weedkillers shown promise against bracken fern, native lime, boxthorn, cacti, or the perennial ground cherry known as potato weed.

Availability and Cost.

Three weedicidal hormone preparations are available in Queensland. These are "Methoxone," "Weedone," and "2, 4 Diweed." The lastnamed is marketed in powder form for mixing with water on the farm; the other two are concentrated solutions which have to be further diluted on the farm. They are all different forms of the hormone 2, 4 dichlorophenoxyactic acid and apparently differ little from one another in their effects on most plants, though critical tests might show one more suitable than the others for a specific purpose.

The cheapest rate at which the hormones are likely to be available in weedkiller form for some time yet is about £1 per lb., representing an outlay for spray material of at least £1 per acre in the case of the most susceptible weeds and considerably more for weeds of higher resistance.

NUT GRASS CONTROL.

The control of nut grass on cultivated land remains a very difficult problem and in many circumstances it is impossible to do more than hold the weed from spreading. Experimental work now in progress suggests that both a new type of weedkiller (the hormone type) and certain soil fumigants may be effective in destroying nut grass, but at the moment no definite recommendations for their use can be made. With a weed such as nut grass, whose tubers may lie dormant in the ground for a long period, it is impossible to finalize control trials in a single season, and probably a further year or two years' investigation will be necessary to work out an economical treatment.

The following measures have been used with some degree of success against nut grass, and individual farmers may find that one or more of them may be applied to their particular conditions. It might be mentioned here that the parasitic insects of nut grass in Australia do not appear to exercise any great degree of control of the pest and entomologists do not consider it worthwhile introducing them to new districts.

Chemical Methods.

The common weedkillers such as arsenicals and chlorates effect some "kill" of nut grass when applied as sprays, but movement of the poison throughout the underground system of tubers is usually not sufficiently thorough to thin the weed out to very small proportions.

Chemicals which sterilize the soil will, of course, destroy nut grass if they are applied in quantities sufficiently large to ensure sterilization to a depth of 18 inches or more. Thorough sterilization will throw the treated land out of cultivation for upwards of a year, the period depending on the chemical used, the soil type, and the rainfall experienced. Soil structure may be adversely affected. Consequently, it may be inadvisable to use soil sterilants except where only small patches are infested. Sodium chlorate at the rate of at least 4 cwt. per acre and ordinary salt (such as coarse butcher's salt or waste salt from hide stores) at the rate of at least 5 tons per acre can be used as soil sterilants.

The hormone type of weedkiller mentioned above is on the market in Queensland under the trade names of "Methoxone," "2, 4-Diweed," and "Weedone." The basis of weedkillers of this type is 2, 4-dichlorophenoxyacetic acid. Farmers wishing to test this type of weedkiller should at each spraying apply the equivalent of at least 2 lb. of the active constituent per acre. This represents a minimum cost of £2 per acre per spraying. The weed should be sprayed when in the young and actively growing condition and not during the winter months.

Some farmers are under the impression that hormone-type weedkillers can be used against nut grass in growing vegetable crops. This is incorrect. So far as is known, only true grasses and cereal crops are not seriously affected by amounts of the hormone-type of weedkiller necessary to harm nut grass.

Cultural Methods.

One method of tackling nut grass is to cultivate at frequent intervals in order to destroy the young leaves before they can manufacture foodstuffs and supply them to the underground storage organs—the tubers. The success of this method depends on regular cultivation. If, owing to a long period of wet weather, cultivation is long delayed, the tubers will have a chance to recover from the effects of any previous regular cultivations. Cultivation seldom eradicates nut grass from a paddock, but if it can be carried out thoroughly—say at fortnightly intervals over a year or two—it will probably enable crops to be grown for three or four years without severe competition from the weed.

Care must be taken to avoid spreading nut grass from paddock to paddock on the cultivating implements.

Infested paddocks on which it is costly to grow row crops because of the large amount of tillage necessary would in many instances be better devoted to a strongly competitive semi-permanent crop such as lucerne or pasture. Such crops if properly managed tend to weaken the stand of nut grass and may permit a rotation of annual row crops and semi-permanent crops to be operated.

Use of Livestock.

Pigs are fond of the tubers of nut grass, and if they are confined on an infested patch for a reasonable length of time and permitted to root in the soil they will reduce the infestation considerably.

Poultry can also be used to reduce nut grass infestations If run on a restricted area, so that all shoots are plucked as soon as they appear above ground, fowls will very largely clean an area within a couple of years.

Flaming.

It is claimed by some American authorities that frequent flamings will destroy nut grass. This method of treatment is now under test in Queensland. Farmers with a flamethrower or a weed burner attachment may find it worth while to carry out tests on their properties.

CONTROL OF JOHNSON GRASS.

During recent years a very encouraging degree of success has been achieved in the destruction of Johnson grass by means of weedkillers. Treatment is rather expensive and in some cases does not give a complete kill. Factors such as stage of growth, season, amount of moisture in the soil, and even the time of day at which spraying is carried out, all appear to influence the results of spraying weeds with underground stems. Consequently, a considerable amount of investigational work is necessary before the best set of conditions for spraying can be determined.

Until definite recommendations can be made, the following procedure is suggested. It is a somewhat tighter procedure than that adopted by some farmers, who are apparently getting satisfactory results with a wide range of treatment, but new users can deviate from the procedure outlined if they desire to experimnt.

Weedkiller to Use.

The weedkillers which have proved satisfactory against Johnson grass have sodium chlorate or a mixture of sodium chlorate and calcium chlorate as their poisonous base. For a heavy infestation carrying a bulky topgrowth the amount of chlorate necessary per acre is about 400 lb. Straight sodium chlorate may be made up at 1 lb. per gallon of water and the solution applied at 400 gallons to the acre. An equivalent amount of chlorate would be contained in about 160 gallons of "Atlacide Solution" diluted with 240 gallons of water. These are 10 per cent. strengths—that is, 1 lb. of chlorate in 1 gallon of spray solution. In some cases probably a 7½ per cent. strength—that is, ¾ lb. of chlorate in 1 gallon of spray solution—would suffice, but farmers starting off on spraying are advised to use the stronger solution.

Chlorate for weedkilling purposes costs roughly one shilling per pound, so the cost of material for a dense acre would be about £20, with additional expense for follow-up applications on a smaller scale.

The efficiency of the weedkiller may be increased by adding a wetting and spreading agent—such as Agral 2 at the rate of 1 lb. to 100 gallons of spray solution.

Stage of Growth.

Though some farmers claim to have had good results from spraying young growth of Johnson grass, experimental work suggests that the flowering stage is the best stage in which to attack the weed. It is generally accepted that a fairly large amount of chlorate must be carried down into the underground stems in order to ensure their death. A large topgrowth, such as is present in the early flowering stage, would be more likely to absorb the requisite amount of chlorate than a less prolific growth. It is quite likely, however, that if a heavy application of spray is made, the fairly large proportion which runs to the ground would in due course be absorbed by the underground runners and assist in their destruction.

Soil Conditions.

Little information is available as to the best soil conditions for the action of chlorates on plants with rootstocks. As already pointed out, in order to kill the vigorous underground creeping stems, movement of the chlorate in the sap from the leaves downwards is necessary. Theoretically, this movement is greater when soil moisture is low than when the soil is wet. Consequently, spraying may possibly be most effective if carried out in early autumn when the soil is drying out after summer rains, or in a dry period following early spring rains.

Time of Day to Spray.

Here again there is little information available for Johnson grass. Downward movement of chlorates absorbed by leaves is usually more rapid if the plants are sprayed after sundown, but in Queensland satisfactory kills have been obtained by ordinary daytime spraying.

Equipment.

The chlorates are non-corrosive and can be used in any spraying equipment. Knapsack spraying appears to be less effective than using a power spray outfit of the orchard type. The latter is, of course, much faster and spray booms up to 40 ft. in width can be used.

Precautions.

Though chlorates are much less dangerous to use than are arsenicals, they present some special hazards. In the first place, plants sprayed with chlorates are rendered specially attractive to stock, and though the amount of chlorate eaten may not be sufficient to kill the animals, possibly the prussic acid normally present in Johnson grass would lead to death.

Sodium chlorate when it dries out on inflammable material, such as clothing, is very easily ignited. Clothes and boots should therefore be thoroughly washed after being wetted with chlorate solution. "Atlacide" is comparatively safe to use because it contains chemicals which absorb moisture from the air and prevent the chlorate from drying out on the clothes.

[Photograph, Department of Agriculture and Stock.

Plate 36.

AFTER THE MUSTER—Group at the delivery of 102 Prime Bullocks at Kingpah, the property of Mr. J. Faulkner, near Moogra, West Moreton.

Left to Right (*Standing*)—Leo O'Brien, Gus. Hohenhouse, Jack Faulkner, Don. Faulkner, Bob Corcoran; (*Top Rail*)—John Reid, Col. Joyner, Harry Head, and R. J. Price (Wilson Meats Ltd.).

Half a Century in Queensland Agriculture.

STORY OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

PART 2.

J. F. F. REID.

AFTER the inauguration of the Australian Commonwealth, departmental activities expanded widely. From an official summary (undated, but probably of 1905) of new legislation and events of departmental importance since 1st January, 1904, the following notes are taken:—

Administration of central sugar mills was transferred to the Treasury.

The Meat and Dairy Board administration was merged with that of the Department, instead of, as formerly, by a secretary and staff.

The care of gardens around public buildings became a departmental responsibility.

New staff appointments included: Dairy instructor, dairy inspectors, cream and grading inspectors; assistant agricultural chemist and five cadets; poultry instructor; an agricultural inspector in place of an agricultural adviser; shearers and sugar workers' accommodation inspectors; a cadet under the Government Botanist; slaughtering inspectors; the substitution of a Queensland fruit and plant inspector at Wallangarra in place of a New South Wales official; manager and staff of the Roma State Farm; a tobacco expert (re-appointment); and additional fruit inspectors in North Queensland.

Appointments allowed to lapse (as no longer required) included: Assistant instructor in fruit culture, viticulturist, and agricultural adviser.

For the Queensland Agricultural College additional breeding stock were imported, as the demand for pure-bred animals greatly exceeded the supply; additions to water supply plant and farm machinery were obtained; two silos were built; roads fenced; 100 acres cleared and 25 acres planted with paspalum grass.

At Westbrook State Farm, a small irrigation plant was installed, and pure-bred poultry stock acquired.

At Hermitage State Farm, sheep, cattle, pigs and poultry were included in the breeding stock; a system of farm apprenticeship was instituted; introduced pasture plots were established; and grain experiments were continued. It was reported that as a result of several years' experiments crossbred wheats which, that year, had withstood rust attack in the Maranoa district had been evolved.

At Biggenden State Farm additional pure-bred cattle, pigs and poultry had been obtained; a system of farm apprenticeship instituted; a silo had been built; and pasture experiment plots laid down. It was designed to work this property as a model dairy farm of 80 acres intensively cultivated.

At the Gindie State Farm there was an entire change of policy from agriculture to grazing. The farm was redesigned as a grazing

homestead area stocked with beef and dairy cattle, sheep (Shropshire-Merino crosses), pigs and poultry. Conservation of fodder (using native grasses) also was to be practised.

At the Roma State Farm (then a new establishment), of 730 acres 100 acres were put under wheat in the first year for experimental purposes, and dry farming experiments were initiated. Some crossbred wheats had proved drought-resistant. A silo also was built.

At the Kamerunga State Nursery, a water service by gravitation from Rocky Creek was completed. The preparation of growers' coffee for market and for sale on owners' account gave "very satisfactory results." Coffee machinery and a cotton gin were installed.

Stud cattle and pigs were imported from England "for the Department and for private persons, the selections being made by an officer of the Department sent to England for that purpose."

The Agricultural Chemist initiated analyses of dairy products for export in order to improve manufacture, fodders and grasses, wheats and other grains for which a special mill was imported, and of sugar cane to prove value. The testing and marking of dairy glassware to ensure correctness also were included among additional services of the chemical laboratory.

There was an organised effort to improve grain cultivation before the establishment of the Roma State Farm by the laying down of farm plots in the Maranoa, by the introduction of hard and other drought-resisting wheats, and the making known to millers and others the values of wheats grown, as determined by analyses.

The Department ginned cotton for growers at Ipswich and sold it on growers' account. The result was so encouraging that a private firm installed plant for the treatment of future crops.

A profitable market was "established in England for *Backhousia citriodora*," an essential oil.

A trial shipment of citrus fruits to the Philippines was successful as an experiment in transport.

Machinery was installed "for treating manufactures of fibre (sisal hemp) and sale of it at a price that proves it to be of great value to Queensland." Apparently, sisal hemp production did not come up to expectation, for interest in its cultivation subsequently faded out.

New legislation relating to the land industries of the State and passed during that period included: *The Dairy Acts; Agricultural Bank Act Amendment Act; Native Animals Protection Act*—providing for a close season for the opossum and native bear (koala), and for the total protection of platypus and squirrel, and for the prohibition of the use of cyanide or other poison; *Shearers' and Sugar Workers' Amendment Act*—providing for better accommodation; *Marsupials Act; Fertilizers Act; Weights and Measures Act;* and the *Special Agricultural Lands Selection Act.*

The lastnamed measure provided for "establishment of persons as farmers who are willing and desirous of following that occupation, but have not the means to do so. The Gayndah Group was established under it."

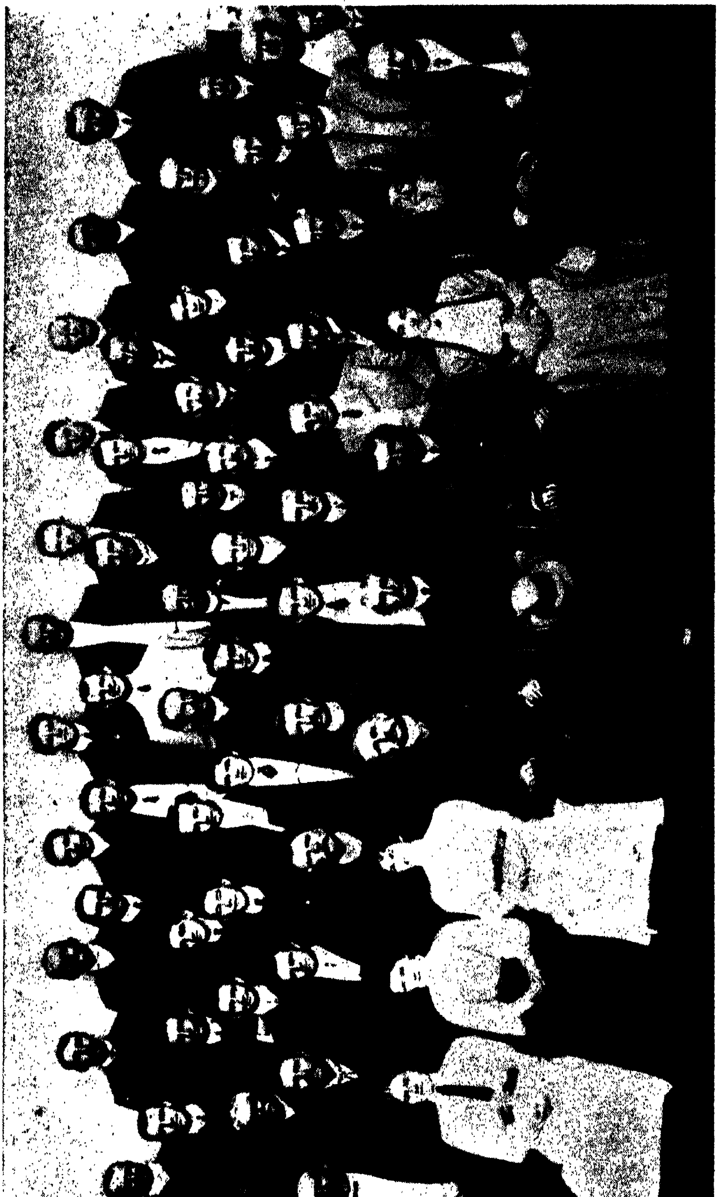


Plate 37.
STAFF OF THE DEPARTMENT OF AGRICULTURE AND STOCK, 1910.

FROM 1907 TO 1917.

In the first ten years of the present century the migration tide of southern settlers was at its top. The slogan "Landless Men for a Manless Land" had penetrated to the apple orchards of the Huon Valley, to the tall timber lands of Gippsland, to the Wimmera, the Mallee and the treeless country below the Goyder Line. Dairy farmers of the Illawarra and of the "Big Scrub," too, had heard of the dense softwood jungles of Queensland covering rich virgin volcanic soil to a depth of 70 feet in places, rain forest country that, they had been told, could be had for next to nothing in comparison with the sky limit values of their own environment. Queensland land laws were said to be the most liberal in the world. Agricultural farm selection was based on the easiest of terms—low valuation, one-fortieth of the purchase money down with one-fifth of the survey fee, and 40 years to pay it, and the right to make it freehold at any time. Had radio propaganda been the rage at that time nothing would have stopped the rush of settlers to rural Queensland.

GROUP SETTLEMENTS.

Under the conditions of agricultural farm selection, group settlements with priority occupation could be formed—priority conditional on personal residence and the making of improvements equal to the cost of erecting a ring fence during the first five years. The idea of migrating as a group looked good to many southern farmers who contemplated pulling up their tent pegs and going to Queensland. In the new settlement areas they would know their own neighbours with whom they could co-operate in the work of pioneering. Like the Israelites of old, they sent out spies to view the Promised Land. Shrewd fellows they were. No starry-eyed romanticists ready to "tackle anything," and so accomplish nothing, among them. They came purposefully over the Border to appraise, estimate and bargain with the Government of the day. From Brisbane they went forth with Lands Office lithos in hip pockets to drop off a train somewhere, spread maps along a log to get their bearings, hire saddle horses and disappear into the bush—to return after a cruise along survey lines, snigging tracks and wallaby pads, with eyes agleam with the joy of discovery and as monosyllabic in speech as a gold digger who has struck it rich and is on his way to the bank with a bag full of welcome nuggets.

Before long, newly selected "scrub" lands were ringing from dawn to dusk with the sound of axes biting into sappy softwoods and, more metallically, into harder brigalow and belah. Down went the scrub in "drives" to dry for the "burn." After the fire, clearings studded with scorched stumps, scarred with charred logs and flecked with grey ash looked anything but promising in their blackened desolation. Soon, however, up through the sooty surface of the soil were to come long, wobbly emerald pencil lines of germinated maize, hand-planted amidst the debris; to be followed later by the green shoots of paspalum or Rhodes grass from seed broadcast along the rows. A crop and a paddock of pasture in a single season—could it be beaten? The untrodden jungle lands of yesteryear are the richly productive farm lands of to-day. The new settlers soon realised the value of the dirt beneath their feet.

The annual report of 1907 stated: "The influx of experienced farmers and their families from the Southern States and elsewhere

is having a marked effect on the agronomy of the districts in which they have settled, and the gain to Queensland agriculture through their advent will be considerable. On the other hand, skilled and reliable farm labour has been scarce and at periods, particularly during harvest time, practically unobtainable for general agriculture as separate from the sugar industry.''

Special Group Selection System.

Ordinary group selection by farmers of experience and capital should not be confused, however, with groups of more or less inexperienced settlers formed under the provisions of the *Special Agricultural Selections Act of* 1905. That measure was introduced by Hon. Digby F. Denham, then Secretary for Agriculture. Its purpose was to assist married men of good repute, but without means, to settle on the land. Mr. Denham said in Parliament that the measure marked a departure in methods of dealing with the unemployment problem. The land was to be selected by the Departments of Agriculture and Lands conjointly and necessary financial assistance was to be given to the settlers in the form of loans covering rent, survey fee, sustenance, and necessary buildings, fencing, stock, and equipment, to be repaid as the land was brought into production. Amount of advances was limited to a modest sum, £140. A supervisor was to be appointed for the first two years and his salary was to be chargeable to the group.

There was, however, a marked contrast between the *Special Agricultural Selections Act of* 1905 and the *Co-operative Communities Land Settlement Act of* 1893, which provided that no member of a settlement group could have any individual interests in the improvements he effected. The new measure gave the individual selector the right of entire interest in the improvements he made on his holding. Other provisions of the measure of 1905 included balloting for blocks which were to be acquired on a fee-simple basis at an agreed price. In all things, each settler was to get the benefit of his own individual efforts. The Act was an attempt to put ''the waste labour on to the waste land by means of waste capital, and thus convert this trinity of waste into a unity of production.'' It was designed as ''a special form of assistance to needy men.'' Good land and good management were regarded as essentials, plus, of course, capital assistance in the form of a loan on easy terms.

Some idea as to how this special group settlement scheme worked out in practice may be gained from the following comments of the Under Secretary of the Department of Agriculture and Stock in his 1907 report:

''It is probable that no body of men in Queensland, with their families, have started farming with the advantages that those who were selected as members of this group commenced their life on the land allotted to them. The rent of the land has been paid on their account; money has been advanced for rations, clothing, tools, and other necessaries; and an overseer has been appointed to direct and guide them through the difficulties that must inevitably be met'' in the pioneering stage of farm life in virgin country.

The first contingent left Brisbane in July, 1906; but, notwithstanding the advantages offered, and the many claimants for those advantages, it was not until June, 1907, that all the selections, 23 in number, were occupied.

As soon as the land was ready for occupation, 75 families were selected from the applicants at that time, from whom, after due inquiry, the members of the group were chosen. Difficulty in finally filling the selection list will be more readily appreciated from the following extract from the report:—"Families invited to join the group numbered 61; families who refused after making application, 22; applicants who declined after acceptance, 9; families who left the group after joining, 7." Apparently applicants on investigating the conditions of the agreement they were asked to sign did not view work on the promised land as easy a job as they had expected.

"At one time," the report continues, "there were signs that some of the members residing on the area appeared to think that there was no need to work hard, and as the result of an inquiry, two members were required to withdraw and a third was cautioned as to his future conduct. The warning had an effect upon the man, but as his family abandoned the selection he was forced to retire also, because the essence of this Act being the settlement of families, single men or men living apart from their families are debarred.

"The experience of the year has shown that the difference between those who have received the advantages of this Act and the ordinary selector . . . is very wide indeed. The man who has to fight his own way makes the best of what he has or what he can fashion or produce without murmuring, in the hope that by hard and continuous labour fortune will smile on him and his home will be secured for himself and his family. With some of those who have received assistance from the Government, on the other hand, it would seem that they consider themselves badly treated if anything they ask for is refused. Meetings to raise agitation to secure certain ends that were desired, but would not be allowed, were held for attaining the objects desired. If that which was asked for were not granted, a meeting would be held denouncing the overseer for his refusal." This caustic comment was not applied to the whole settlement, but only to the few who did not fit in.

The report goes on: "Under the Regulations, a settler is allowed to borrow £80 towards the purchase of clothing, rations, and the means of living generally; and £60 for stock and implements; but he is not allowed, unless in exceptional circumstances, to disburse the money. . . . Experience has shown that it has been impossible to work to the exact limit of the Regulations. Families differ in number and are of various ages . . . therefore it has been necessary to somewhat exceed the limit in some cases.

"The provision of facilities for sending cream to the factory at Maryborough has been another reason for increasing the individual indebtedness with the view of shortening the time when the members of the group will be self-supporting. Bulls and cows have been purchased and sold at cost price, and members receiving them have to sign an agreement that as soon as five cows are in milk they will cease to receive rations and clothing. The efforts in this direction have been somewhat hindered by a disastrous outbreak of redwater among 100 heifers bought for the group. Unfortunately, the mob arrived at Wetheron just at the time when the river (the Burnett) and creeks were in high flood, and the cattle could not cross. They were placed in a paddock, but very soon developed tick fever and many died. In July, 1906, the group entered into the possession of

an area of 4,391 acres that was in a virgin state and was formerly part of a cattle run. In July, 1907, the land was occupied by 23 families consisting of 23 men, 23 women, and 128 children."

From the foregoing excerpts from an official source, it may be fairly deduced that farming on community lines under a system of paternalism may not be as successful as the advocates of community farming may believe. The history of other "managed" group settlements in Queensland, before and since, is equally interesting and illuminating, as examples of the primary importance of the personal equation as a factor in successful land settlement.

DEVELOPMENT OF THE DAIRY INDUSTRY.

Apart, perhaps, from the pastoral and sugar industries, no other primary industry had made such progress in the previous ten years as the dairy industry. The coming of the cream separator into general use and the resultant change over from farm to factory butter manufacture and the opening of new dairying country were among the main factors in its remarkable development. It was not so very long before that Queensland farmers could not make enough butter for home requirements. When the exporting stage was reached, many handicaps had to be overcome, including the difficulties connected with refrigerated space and freight rates. Regular shipments and rapid transport to British markets involved transhipment at Sydney from coastal steamers, increased expense and risk of deterioration. A State subsidy induced one and then another shipping company to make Brisbane its terminal point in Australia and to provide refrigerated chambers for butter at reduced charges. Some years had to pass before Queensland was on the same footing as the other States.

On its appearance in London, Queensland butter had to be sold for lower prices than were paid for other butters with an established reputation and buyers were often dissatisfied because of variations in quality. To remedy this, legislation providing for Government inspection and grading had to be passed. After that system had been initiated, the Queensland product soon attained parity with the butter of the Southern States and New Zealand and the general standard was undoubtedly higher than in pre-grading days.

Coincident with the improvement in the quality of butter was the progressive improvement of dairy herds. Good milking strains had been introduced and more attention was paid to feeding of dairy cows. To the Department is justly due much credit for these changes, by both educational effort and consistent administration of dairy legislation. "The continued influx of experienced farmers from the South," said the departmental chief in 1908, "will go far to advance the industry, but, generally, greater attention is needed towards providing fodder for cows during dry periods and shelter during the winter months."

The year before, experiments in silo construction and filling were commenced on the State farms. Various types of silos and materials for their construction were then under consideration. Silos of iron, fibro-cement and of iron and malthoid were erected. At Hermitage, an octagonal 130-ton fibro-cement structure was built and partly filled with sorghum from a field which yielded 14 tons to the acre. The manager stated: "This silo was filled early in April (1907) and the result is that

we now have a fine supply of good, nutritious feed available at any moment, which otherwise would not have been preserved. The older and smaller silo was filled at the same time with about 30 tons of red kaffir corn and a few tons of lucerne.''

Because of the lightness of the material, the use of fibro-cement in silo building was not generally successful. Many farm silos were erected that year, but then, as now, the problem was to keep them filled. ''There is no State in Australia that offers such opportunities for successful dairying, and the country only awaits those who will take advantage of the benefits offered,'' was the departmental dictum in 1908. Since then the output and value of the industry has increased tenfold and great as are its present dimensions they are small in comparison with the possibilities of expansion.

DEVELOPMENT OF TROPICAL AGRICULTURE.

Of the development of tropical agriculture, it was reported: ''There is evidence that farmers are inclined to cultivate main crops other than maize and sugar, which have so long dominated the agronomy of the tropical regions. Plantings of rubber have been made which, though small at present, indicate a commencement and it is hoped will be the forerunners of Queensland rubber in the market. The success attending the experiments in cigar tobacco on the Northern Coast, and the good prices realized for the product, have encouraged several farmers at Bowen and Cardwell to undertake the cultivation of this plant, and it is but a matter of time before the area under cigar tobacco in this State will be considerable.

''Agriculture is so extensive in its application and so variable in its circumstances, including as it does all relations of man with the soil, that it is impossible to include every branch of so wide a subject within the pages of a report.

''Diversity of products is to be expected, of course, in a country stretching through 18½ degrees of latitude, possessing an extraordinary variety of soils and climate. There is probably no other country with so wide an agricultural range. To mention crops which can be grown successfully would mean listing nearly every crop of economic value found in the torrid or the temperate zone.''

In annual reports of the first decade of the century there were repeated references to the possibilities of rubber production in the tropical parts of the State. The report for 1907-1908 states: ''Mr. Newport, the Instructor in Tropical Agriculture, by writings and lectures, has been assiduous in trying to induce farmers in the North to plant rubber . . . and these efforts have been, to a certain extent, successful. There is a slight indication on the Johnstone River . . . that attention is being given to this product, and by arrangement made by this Department some thousands of plants and a quantity of seed have been imported on growers' account.''

At the close of 1908 the number of people in the State, scattered over its 670,500 square miles of territory, was only 558,000. The population has doubled since, but is still less than that of either Sydney or Melbourne.

[TO BE CONTINUED.]

Strawberry Culture.

C. N. MORGAN, Senior Adviser in Horticulture.

THE production areas of strawberries in Queensland are situated along the coastal strip from the New South Wales border to the far north, with the main producing districts within 150 miles north and 50 miles south of Brisbane. The mild winter of this area lends itself to commercial production of this fruit for a considerable portion of the year, giving, in many seasons, a long picking period frequently extending from early June to the end of November. Owing to the shorter winter, crops in the northern portion of the State have a much shorter season.

During the early part of the season, the berries sell readily on the open market in Queensland, and many of the bigger growers send interstate. A recent development is the despatch by air of considerable quantities of berries to various markets. Later in the season, when the market price does not warrant the extra expense of packing, the berries are sent to local canneries for jam making. During the war years the fresh fruit market was able to absorb practically the entire crop, but formerly up to 200 tons of berries were processed in a season. Since the war, the requirements of the processing trade have increased and large plantings have been made especially to satisfy this demand.

Strawberry growing has features which make it attractive to many farmers. Much of the work involved is light. The cost of establishing a patch is not excessive and the returns are quick. The crop is thus a useful one for a new farmer who is anxious to get some early cash return from his land. However, careful attention must be given to the selection of a suitable site and unremitting care taken with cultural details if success is to be assured.

Location and Soils.

The location of a property for strawberry growing should be in a district with ready access to market, enjoying suitable climatic conditions, and, in many cases, a reliable irrigation supply. The latter condition depends usually on the type of soil to be used. Some of the sandy and volcanic types of soils dry out quickly during the fairly dry winters usually experienced in Queensland. Such drying out results in a rapid drop in production.

Strawberries appear to do well on almost any type of soil, provided climatic conditions are satisfactory, but the most popular are the well-drained, sandy loams, with good water-holding capacity, or, where irrigation is possible, red volcanic types rather than the heavier loams. The latter, however, have the advantage of retaining moisture well; and where the drainage is good may be profitably employed, especially if irrigation water is unprocurable, or in light supply. Badly drained soil is never satisfactory as it remains too cold and weed growth is most difficult to control; and, furthermore, root rots are very apt to develop under wet conditions.

Plate 38.
A Well Grown Strawberry Crop.

Normally, in the main areas, frosts are light and do not appear to affect the strawberry adversely. Thus, portions of many farms which, during the winter are unsuitable for many other crops, are quite satisfactory for strawberries. New land has many advantages for strawberries, not the least of these being freedom from weeds, but old land, well prepared, will grow good crops provided it is well supplied with humus, and fertilized correctly.

Preparation of Land.

As planting is done in the autumn, preparation should begin some months before, in order to get the soil into as good a condition as possible. For this reason, preparation of either new or old ground should begin in the early spring. Although the strawberry is not a deeply rooted plant, ploughing of the soil to a depth of eight inches is recommended, as a good depth of well-tilled ground improves the water-holding capacity. In the case of new ground, it will be necessary to allow it to fallow for two to three months before a second ploughing is carried out. With old ground, a cover crop of Poona pea or corn should be sown during the spring or early summer and ploughed under at least two months before planting. After it has rotted a further ploughing

and subsequent harrowing and cultivation should be carried out until the land is in good condition. Constant cultivation following the final ploughing does much to firm and level the ground as well as control weed growth.

Some growers find that strawberries do well on ground following a late spring crop of tomatoes, cabbage, beans, &c., crops which have usually been well fertilized and which leave the land in a good state of tilth. Preparation of this ground is comparatively easy.

Fertilizing.

Fertilizing practices vary to some extent, depending largely on variations in soil conditions. For instance, on a soil rich in organic matter, or following a crop that had received heavy fertilizer dressings, the necessity for heavy dressings is not as great as on a piece of old ground which has not been used for some time.

For pre-planting applications, farmyard manure, if procurable, is recommended, and this should be applied to the soil during the final preparation, a few weeks prior to planting. Commercial fertilizers have also proved satisfactory for this purpose, particularly on well-prepared ground containing a reasonable amount of organic matter. As strawberries are planted close and must be kept growing quickly, the base dressings of fertilizer should be fairly heavy, and amounts of from 15 cwt. to 1 ton per acre are not excessive. A complete mixture high in phosphoric acid, and containing a medium proportion of nitrogen, is recommended; as many of the soils, particularly the red volcanic, readily "fix" a large part of the phosphoric acid and thus make it unavailable, it is advisable to spread the fertilizer in a narrow band about one foot wide along the ground, where the rows will be, rather than broadcast it over the whole area. The fertilizer should be cultivated in about 7-10 days prior to planting. Heavy dressings of nitrogenous fertilizers at planting often cause the plants to produce excessive leaf growth.

Top dressings of fertilizer will probably be necessary during cropping; the extent of these will best be judged by the appearance of the plants and crop. Usually the first top dressing is done at first flowering, and then further dressings applied as required. Each top dressing should take approximately 1-1½ cwt. of a water soluble fertilizer, fairly high in nitrogen. Top dressings may be applied alongside the plants, or in between the plants in the row, and should be made carefully to avoid dropping the fertilizer on the fruit or leaves, thereby causing burning. After top dressing, if irrigation is available the plants should be watered to dissolve the fertilizer and wash off any that may have fallen on the leaves.

Planting Material.

Strawberries are grown in Queensland as an annual crop and it is only on rare occasions that the parent plant is allowed to remain in the ground to produce fruit for the second season. The reasons for this are that it is most difficult to keep a big area free from disease, weeds and runners during the hot summer months. Whilst it is usually possible to obtain a few early berries from a second season's crop, these do not compare either in size or quality with the first fruits of the new season's plants. Annual planting is, therefore, strongly recommended.

Most growers use their own runners, leaving only enough old plants to provide sufficient planting material for the following season. From 1,000 to 1,500 plants should yield enough runners for an acre, providing they are well tended. It is particularly important to keep plants that are of good quality, true to type and free from disease, as a few undesirable "mother" plants provide the nucleus for a most unsatisfactory patch of berries after a few years of indiscriminate plantings. Severe "rogueing" should, therefore, be carried out in the prospective runner bed. Diseased and weakly plants should be eliminated as soon as they are detected; others, which for any other reason are undesirable as "mother" plants, but which are bearing a good crop, should be clearly marked and then cut out as soon as picking is finished.

Plate 39.

STRAWBERRY PLANT COMMENCING TO SEND OUT RUNNERS.

Every effort should be made to encourage production of sturdy, well-rooted runners. Cultivation of the ground between the rows, watering of the old plants, plus a light top dressing of fertilizer as the runners appear, will help considerably to ensure an adequate supply of good material. Suitable types are shown in Plates 39-41.

Runners usually appear about December. Complete weed control is difficult at this time of the year, but should be carried out as well as practicable before the runners spread out between the rows. Where the runners grow in competition with weeds and are shaded by them, they tend to produce long, weak leaves, which wilt badly after being transplanted. Furthermore, such runners commonly carry numerous weed seeds to the new area.

Prior to removing the runners for planting, the beds should be well watered, to facilitate digging. In order to avoid injuring plants, it is best to dig the runners by starting at some given point, and not to walk through the area indiscriminately. Lifting the runners should be done as carefully as possible, and for this purpose a small trowel or a

strong-bladed knife will be found most suitable. When free, the roots are trimmed to about three inches and all broken and dead leaves removed. A few of the older leaves also may be removed, if necessary, to lessen transpiration after planting out. After trimming, the runners should be placed in a bucket containing a little water, or between wet bags. The plants should not be exposed to the wind and sun any more than is necessary. No more should be dug than can be replanted on the same day.

Plate 40.

A STRONG, HEALTHY RUNNER SUITABLE FOR PLANTING.

Only healthy runners with a good root system and a well developed crown should be used for planting. Growers have often been advised to use only first or second runners as planting material, but when the runners are massed together it is a difficult and tedious job to do this. Furthermore, it has been found that very little difference is apparent between the times of cropping, if care is taken to select sturdy plants.

Planting.

The main month for planting is March, but the operation may be carried through to early April without affecting the earliness of the crop to any great extent. Some growers plant in February, contending

that the plants will crop earlier. This is, however, not always the case, and February plantings cannot be recommended as a general practice. The hot weather during this month often results in losses, particularly where irrigation is lacking or inadequate.

Plate 41.
THE RUNNER SHOWN IN PLATE 40 PRUNED READY FOR PLANTING.

Care in transplanting is essential, and much of the early loss and ultimate unsatisfactory growth of the plants can be traced to carelessness at this time. The runners must be set at the correct depth, i.e., with the crown just above ground level (Plate 42). Should the crowns be below ground level they often die or make unsatisfactory growth. If they are too high there is a risk of the roots drying out. It is only possible to set plants correctly if the rows have been well prepared and levelled by raking or some other means. Before planting, a wire should

be stretched along the row and the plants set along it, in order to keep a straight line. This assists in cultivation, whether horse or hand implements are used.

Plate 42.

PLANTING OF RUNNERS—Left: Correct Depth. Centre: Too Shallow. Right: Too Deep.

When planting, the hole may be made by hand or trowel, and should be large enough to take the plants which are set at the correct depth; at the same time the roots are spread in a fan shape. The soil around the roots should be made thoroughly firm, and in this operation care should be taken to avoid getting soil into the crown of the plant. As soon as possible after the plants are set out, they should be watered by irrigation or by hand. This should not be delayed longer than after the completion of each row of, say, five chains. Planting out is best done in the afternoon.

The most popular method of planting is in single rows, the distance between rows and plants depending on type of cultivation, irrigation and disease control to be employed. For horse cultivation, up to 2 ft. 6 in. between rows and 12 in. to 15 in. between plants is allowed, while for hand cultivation, 2 ft. by 12 in. to 15 in. is satisfactory.

Numbers of plants per acre are as follows:—

Distance Between Rows.	Distance Between Plants.	Number of Plants.
2 feet	12 inches	21,780
2 feet 6 inches	12 inches	17,424
2 feet	15 inches	17,424
2 feet 6 inches	15 inches	13,939

Cultivation.

Cultivation between the rows and plants should be carried out to control weed growth. As the strawberry is not deeply rooted, cultivation should be shallow. A dutch or flat hoe is usually used for close work between the plants and small hand cultivators, fitted with hoeing attachments, are used between the rows (Plates 43 and 44). If a horse cultivator is used it may be fitted with "duck-foot" type of tynes to ensure shallow working. When chipping, care must be taken not to pull the soil away from the plants, thus exposing the roots. At the same time, it is essential to avoid any soil lodging in the crowns.

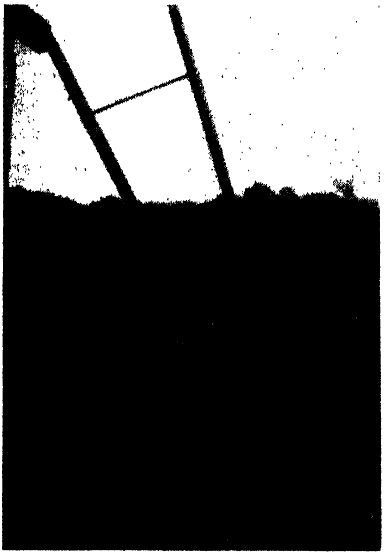


Plate 43.
HAND CULTIVATOR SHOWING HOEING ATTACHMENTS.

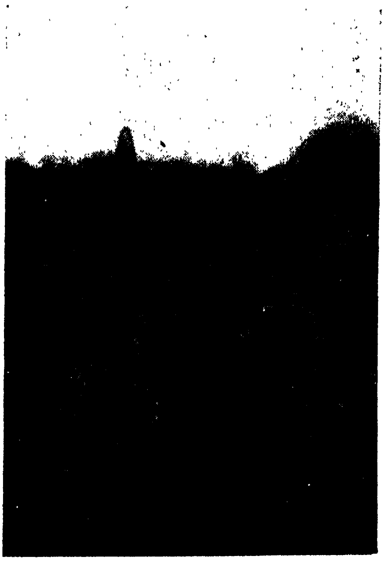


Plate 44.
METHOD OF USING HAND CULTIVATOR.

Irrigation.

Irrigation for strawberry growing is highly desirable, as the plants, being shallow-rooted, quickly show the effects of dry weather.

On the red volcanic loams it would be difficult to grow a crop through the season successfully without irrigation, except in the high rainfall belt. Some of the other types of soils do not dry out nearly as quickly, and, with reasonably good rains in the spring, will crop well to the end of the season. Most irrigation is done by the overhead system, which appears to be most suitable for strawberries. Watering should be done after picking and should not be excessive but sufficient to keep the plants growing and cropping satisfactorily. Over-watering should be avoided and splashing should be guarded against as far as practicable.

Mulching.

Mulching is not done to any extent, but where it has been tried, has usually proved of great advantage. Apart from the aid in controlling weed growth, it helps to prevent evaporation of moisture from the soil and keeps the berries free from dirt splashed up by rain or irrigation water. On the other hand, damage to the fruit from certain ground-frequenting insect pests may be aggravated to some extent when a mulch is used. Materials for mulching, which are easily obtained, are oak-leaves or blady grass, and these, if spread around the plants to a depth of an inch, about six to eight inches on either side, soon settle down to a good, firm mulch. The presence of such a soil covering does not interfere with fertilizer top dressings as the soluble chemicals used for this purpose quickly pass into the soil. Sawdust is most unsuitable as a mulch, as it sticks to the ripe berries when picking and is difficult to remove without injuring the fruit.

Plate 45.

FRUIT OF THE PHENOMENAL VARIETY.

Harvesting.

Berries should be picked when they are mature, i.e., when they are about three-quarters coloured. To handle the crop successfully, daily picking during the main part of the season is often necessary, and rarely is it possible to allow picking to extend further than every

second day. A pamphlet on the picking and packing of strawberries for market may be obtained on application to the Department of Agriculture and Stock, Brisbane.

Varieties.

Numerous varieties of strawberries are available but two local selections have so far proved the most satisfactory for Queensland conditions. These are the well-known Phenomenal and Aurie varieties. They are both vigorous growers, producing medium-sized, highly coloured berries of firm texture which are good carriers and suitable for the fresh fruit market and for processing. Both varieties bear flowers which are self-fertile, i.e., they will pollinate and produce crops without having to be interplanted with another variety.

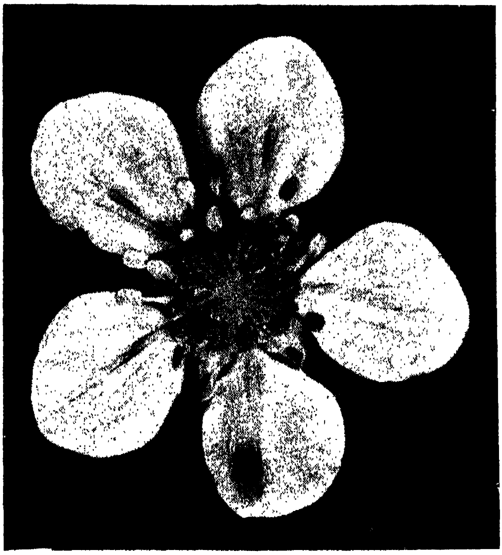


Plate 46.

TYPE OF FLOWER CONTAINING BOTH MALE AND FEMALE PARTS.

Phenomenal is grown more extensively than Aurie. The latter fruits a little earlier and may stand up to dry conditions a little better than Phenomenal. However, the plants suffer rather severely at times from leaf diseases and the quality of the berry is somewhat inferior to that of the Phenomenal.

New growers sometimes purchase varieties from outside the State, but there is nothing to commend this practice, particularly as serious diseases may be introduced in this way.

PLANT PROTECTION

Diseases of Sorghum.

R. B. MORWOOD, Plant Pathologist.

SORGHUM is playing an increasing part in the farming economy of this State. The grain varieties are being used extensively in Queensland to replace maize on account of the drought-resisting qualities of sorghum. These are referred to by many growers by their varietal names—such as Milo, Kalo, and Hegari. A number of varieties of sweet sorghum, including Saccaline, Italian, Leoti, &c., are important summer fodder crops. In addition, broom-millet, and Sudan grass are botanically sorghums, as is also Johnson grass. All these are liable to be affected by the same set of plant diseases but, apart from adopting a simple seed treatment, the grower need pay little further attention to the control of these diseases.

This position is not due to the absence of parasites, as quite a number of fungi and bacteria have been reported to be pathogenic to sorghum. That these pathogens do so little harm is largely due to the work of plant breeders. They have produced and tested a large number of varieties of sorghum and have been ever on the alert for disease. As a result, those strains which have been shown to be susceptible to diseases difficult to control have been largely eliminated. There are now available a number of varieties which can be sown with a high degree of confidence that plant disease will not be a serious factor in production. Unfortunately, this statement cannot be extended to include those disorders caused by the presence of insect pests. Aphids, corn ear worm, and particularly midge, all constitute hazards which have to be considered.

These notes do not deal with these or other insect pests, on which information can be found in various Departmental publications. It is, however, important to distinguish the troubles due to insects from those due to diseases. This is simple enough in the case of the larger insects, which are readily seen. Midges, however, are small enough to be overlooked and the grower may see only the result of their activities. This consists of a head without grain or with only part of the head carrying grain. To those not familiar with the condition, this is easily confused with frost damage or ascribed to some disease.

Smut.

The principal disease affecting sorghums in Queensland is covered kernel smut. This is caused by a fungus* whose spores may be found on seed. When present the spores germinate with the sorghum seed and infect the seedling. The fungus develops inside the plant and may stunt it slightly, but otherwise cannot be detected at this stage. When the plant matures the fungus develops in place of the seed and what should have been a sorghum kernel becomes a black mass of fungous spores. Affected heads can be readily seen in the crop and as many as 25 per cent.

* *Sphacelotheca sorghi.*

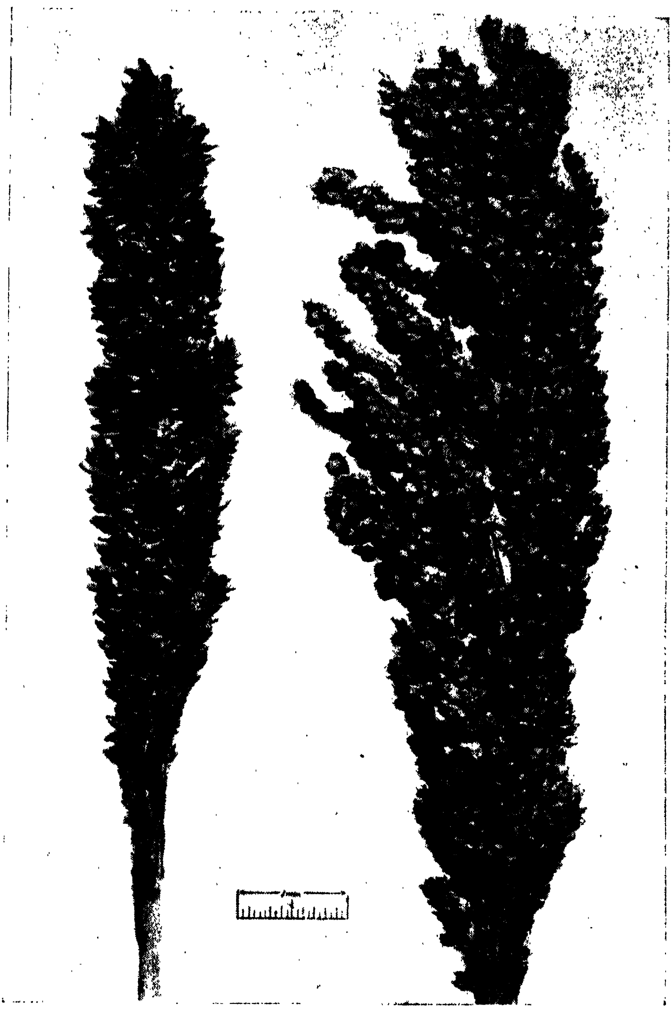


Plate 47.
COVERED KERNEL SMUT OF SORGHUM.—Left: Diseased head; Right: Healthy head.

of the heads have been found carrying smut balls in place of grain. The smut balls are elongate, somewhat conical, covered with a membrane which is at first purple then grey. Usually the whole of the head is affected but occasionally some grain is formed in the same head as the smut. In addition to the direct loss of heads, the remainder of the grain is contaminated with spores on harvesting. Fortunately, smut is not in any way poisonous and such contaminated grain can safely be used for feeding purposes. However, even if only a small percentage of smut is present in grain used for seed it can produce a badly diseased crop.

Sorghum smut is more serious on the varieties grown for grain than on those grown for fodder purposes, as in the latter case the stalk is of equal importance to the seed. Some varieties are much more susceptible to smut than others and, of those grown locally, Kalo is particularly subject to that disease.

Control.

Fortunately, smut can be readily controlled by seed treatment. Either copper or mercury dusts can be used as both are effective. Copper carbonate can be used by thoroughly mixing it with the seed at the rate of 2 oz. per bushel. There are several good brands of copper carbonate on the market in Queensland for use in seed treatment. They require to be finely ground and reasonably free from impurities. Smutol containing copper oxychloride can be used at the same rate as copper carbonate.

Either of the mercury dusts marketed locally—Agrosan and Ceresan—can be used at the rate of ½ oz. per bushel. These dusts are slightly volatile and, as a result, their effectiveness is increased by storing the grain for a day or more after treatment.

The fungicidal dusts are somewhat poisonous so should be treated with respect. Reasonable care should be taken to avoid breathing the dust and a dust mask should be worn if much dust is in the air. The mercury dusts will cause blisters if allowed to remain in contact with moist skin. Dusts should be handled out of doors or in a well-ventilated barn.

Leaf Diseases.

Another group of diseases, which are more noticeable on the sweet sorghum grown for fodder, includes blight caused by a fungus* that is responsible for a similar disease on maize. This fungus produces elongate grey spots or blotches on the leaves which, when numerous, seriously reduce the amount of effective leaf surface.

There are several somewhat similar diseases caused by bacteria, in which the spots are narrower and more elongated and are bordered by red colour. The red colour is not confined to the bacterial diseases, as any injury to a sorghum leaf tends to result in the production of bright-red coloration. For example, it can be associated with aphid attack. Both the bacterial and fungus leaf diseases are more frequent in the scrub areas of the State than in drier districts, such as the Darling Downs. These diseases are sometimes referred to by growers as rust. Actually, a true rust† does occur on sorghum but is seldom found.

There is no direct control for these diseases, but as varieties vary considerably in their susceptibility this factor can be used in avoiding loss. In plant breeding and plant selection work, varieties particularly susceptible to leaf diseases have been, and are still being, eliminated so that the more recent recommendations will be comparatively free from such troubles.

Diseases Not Found in Queensland.

Of diseases not found in Queensland there are a number of fungus leaf spots which are of only minor importance. Another disease, crown rot, caused by a fungus, has been quite serious in the past in the United States. It is recognised by the presence of rotted roots and a reddish-brown discoloration seen on splitting the base of the plant. The rotting of this area results in stunting and premature death of the aboveground parts of the plant. It is being brought under control by crop rotation and the use of resistant varieties.

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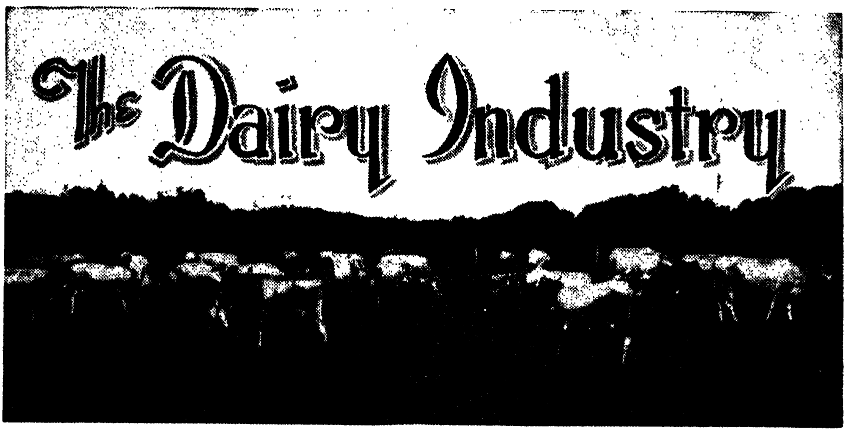
* *Helminthosporium turcicum.*

† *Puccina purpurea.*



Cream Vacreation.

A SIMPLE EXPLANATION OF THE "INTENSITY FACTOR."

T. W. SMITH, Division of Dairying.

IN the evolution of pasteurization, the Murray Vacreator is regarded as the latest method of processing cream for butter manufacture. As is usually the case when the most up-to-date machinery is introduced into industry, there is a shortage of skilled operatives and this is particularly so in regard to the vacreator. Sometimes the person who is to operate the machine is shown how to start it and stop it; but from then onwards he spends some time groping his way along until he becomes thoroughly conversant with the vagaries of the machine. At the present time, there are some vacreator operatives in this predicament. They are operating machines (and in many instances doing a good job) without actually knowing why they are doing certain things.

The following will elucidate some of these points of cream vacreation.

The Value of Cream Processing Records.

As the processing of cream in a Murray Vacreator consists of a washing or cleansing process, in combination with pasteurization, it should be obvious that the vacreator operative should thoroughly understand his machine and be able to determine the intensity of treatment to which the various grades of cream should be submitted so as to maintain uniformity in the grade notes of the resulting butter.

As every cream grader knows, the standard of the cream delivered to a butter factory on a Monday is much below that of cream delivered on a Wednesday and a Friday of the same week, often because of the length of time that the cream must be stored on the farm, where cooling facilities are usually inefficient. The cream grader's effort to maintain a maximum percentage of choice and first-grade cream thus results in an inferior bulk grade being produced.

Where no records are kept, the operative is definitely working in the dark. Where processing records are kept, the treatment applied to the cream can be compared with the grade notes of the resulting butter and the intensity of treatment varied accordingly.

A certain amount of standardization occurs under the vacreation process and where the butter-maker can refer to the records of the treatment being given the cream, moisture control in the manufacture of butter is greatly facilitated.

Function of the Water through Condenser Cones.

Apart from being instrumental in maintaining the vacuum in the machine, the flow of water through the condenser cones performs two other major duties, i.e.—

1. It carries away the volatile impurities of the cream;
2. It is the source from which the intensity factor is determined.

By the water-pressure gauge it is possible to know the number of gallons of water per hour which is passing through each unit of the vacreator.

By noting the rise in temperature which occurs between the incoming water and the outgoing water it is possible to judge the amount of treatment the cream is receiving.

The Intensity Factor.

This can be claimed as one of the most important features of efficient vacreation. The intensity factor is the amount of heat (expressed in B.T.U.) expended per lb. of cream treated. As this heat is applied in the form of steam which mingles directly with the cream, a greater quantity of steam is required than would be the case for merely pasteurizing. In the pasteurizing chamber, heating of the cream and condensation of the steam occurs. The mixture, drawn into the separating chamber, which is maintained at a lower vacuum by the equilibrium valve, boils freely, eliminating the volatile odours. These volatile flavours are then carried up through the gooseneck and away with the condenser water.

This fusion of the steam with the cream and the subsequent evaporation of the steam is referred to as a washing or cleansing process. It should, therefore, be apparent that a bare first-grade cream would require more washing than a good first-grade cream, just as a dirty article takes more washing than a soiled one. In a like manner every vacreator operative should know when he has an inferior quality cream to wash and how thorough the washing must be.

To determine this the following details must be noted:—

1. Gallons of water per hour passing through each condenser.
2. The gallons per hour of the cream being treated.
3. The difference in the temperature of the water entering and leaving the condensers.

The gallons of water passing through the condenser cones are as follows:—

Pressure Gauge Reading. lb. pressure per sq. in.	Single Unit. Gallons per hour.	Tandem Unit. Gallons per hour.
60	1,760	3,520
65	1,800	3,600
70	1,890	3,780
75	1,940	3,880
80	1,980	3,960
85	2,025	4,050
90	2,070	4,140
95	2,115	4,230
100	2,160	4,320

There are various methods of working out the intensity factor, but for rapid factory practice the following will be found suitable:—

Single Unit.

$$\frac{\text{Gallons of water per hour x Temperature rise}}{\text{Gallons of cream per hour}} = \text{Intensity Factor.}$$

Example.

Water pressure per sq. in .. .. = 65 lb.
Gallons of water per hour .. .. = 1,800
Gallons of cream per hour .. .. = 600
Incoming water temperature .. = 80° Fahr.
Outgoing water temperature .. = 140° Fahr.

$$\therefore \text{Intensity Factor} = \frac{1.800 \text{ x } 60}{600} \text{ ..} = 180 \text{ B.T.U. per lb. cream treated.}$$

When a Tandem Unit is installed the gallons of water per hour is multiplied by the MEAN temperature rise and divided by the cream flow.

Tandem Unit.

$$\frac{\text{Gallons of water per hour x MEAN temp. per hour}}{\text{Gallons of cream per hour.}} = \text{Intensity factor.}$$

Example.

Water pressure per sq. in. .. .. = 65 lb.
Gallons of water per hour .. .. = 3,600
Incoming water temperature .. .. = 80° Fahr.
Outgoing water temperature of 1st Unit = 130° Fahr.
Outgoing water temperature of 2nd Unit = 90° Fahr.

∴ Total temperature rise = rise in temp. of 1st Unit plus rise in temp. of 2nd Unit

Total temperature rise = (130° F. — 80° F.) + (90° F. — 80° F.)
= (50° F. + 10° F.) = 60°F.

MEAN temperature rise = 30° F.

Gallons of cream per hour = 600

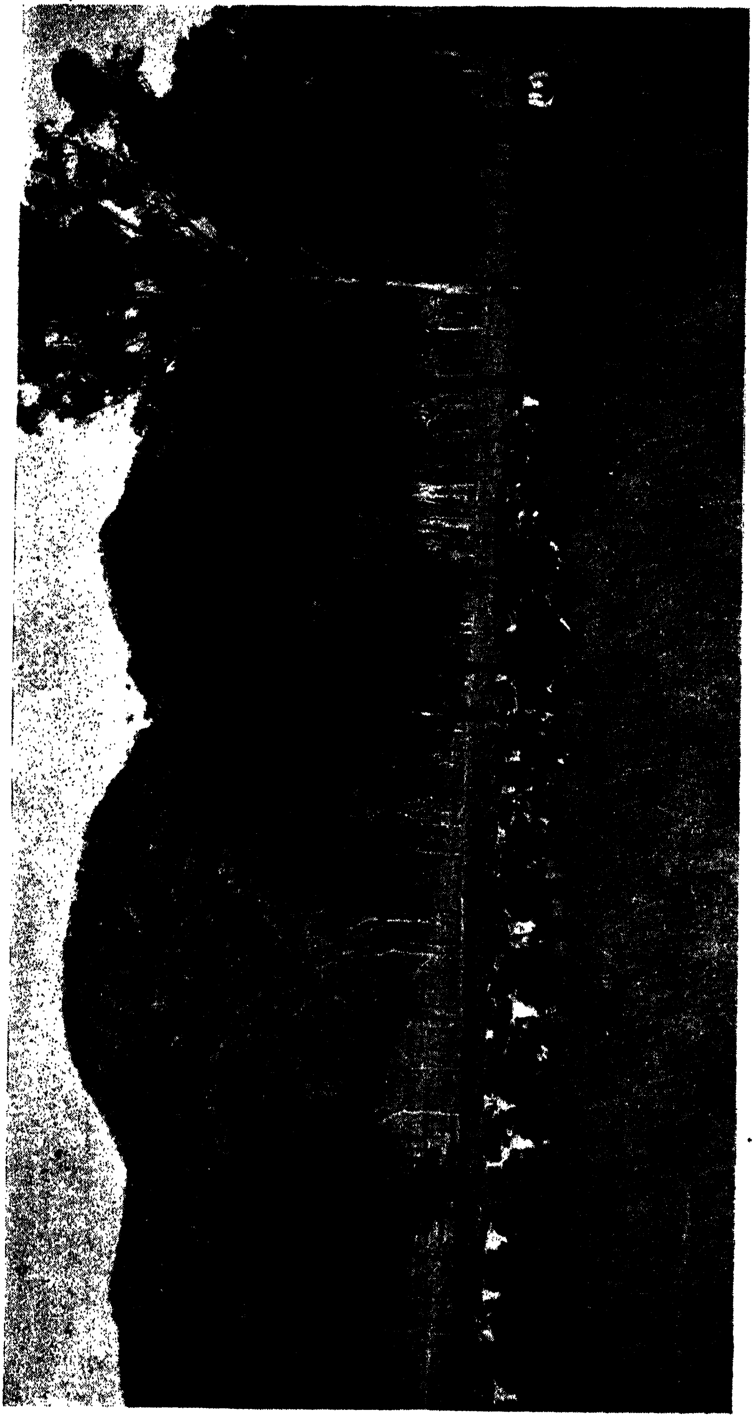
$$\therefore \text{Intensity Factor} = \frac{3{,}600 \text{ x } 30°\text{F.}}{600} = 180 \text{ B.T.U. per lb. cream treated.}$$

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. and Jersey Societies' Herd Books, production records for which have been compiled during the month of June, 1947. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE (STANDARD 350 LB.).				
Alfa Vale Star 10th (365 days)	W. H. Thompson, Nanango	15,618·4	679·879	Penrhos Pansy's Pride
College Rapture 2nd	Q.A.H.S. and College, Lawes	9,803·55	357·728	Dulciman Disraeli
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Navillus Charm 17th	C. O'Sullivan, Greenmount	10,291·45	408·722	Greyleigh Eros
Jamberoo Dignity 5th	A. F. Ezzy, Millmerran	8,445·2	363·38	Murray Bridge Florrie's Prince
Trevor Hill Iris 6th	G. Gwynne, Umbiram	6,960·99	309·368	Balater Czar
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Alfa Vale Pet 3rd	W. H. Thompson, Nanango	10,535·05	417·984	Reward of Fairfield
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Evermoor Fay	W. A. Freeman, Rosewood	10,779·8	408·321	Frenchview Park Lad
Trevlac Vision	W. A. Freeman, Rosewood	10,399·95	392·419	Trevlac Rosette's Combination
Trevlac Biddy	R. Tweed, Kandanga	5,536·2	239·19	Trevlac Rosette's Combination
JERSEY.				
MATURE (STANDARD 350 LB.).				
Palmridges Sylvina	H. Sigley, Jaggan	9,618·1	513·413	Overlook Financier
Palmridges Brown Shore	H. Sigley, Jaggan	7,037·1	459·966	Overlook Financier
Boree Pridette	A. Visini, Gympie	7,884·15	388·059	Maurfield Larkspur's Gift
Kathleigh Doreen	F. W. Kath, Moffatt, *via* Dalby	6,286·55	383·987	Oxford Daffodil's Victor
Trecarne Chimes 5th	T. A. Petherick, Lockyer	8,997·65	371·056	Jerseylea Golden Duke
Kathleigh Bud	F. W. Kath, Moffatt, *via* Dalby	6,139·58	360·392	Kathleigh Jersey King II.

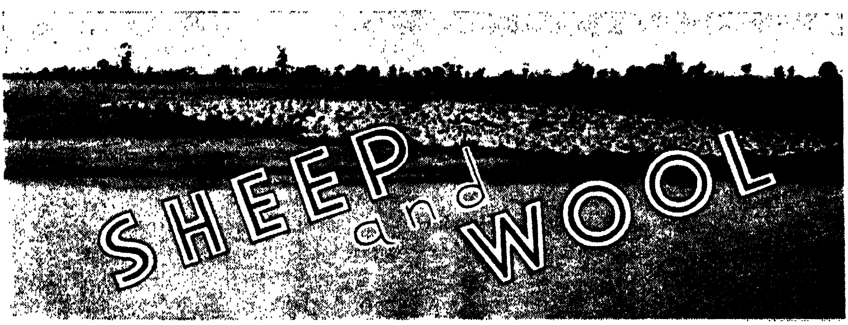
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Glenrandle Lucy	P. Kerlin, Killarney	7,320·0	391·779	Bellgarth Glory King
Westwood Locket	F. Porter, Cambroon	5,544·55	362·889	Westwood Combination
Carnation Designer's Orange	W. Spresser and Son, Ipswich	5,662·3	287·003	Bellgarth Designer
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Westbrook Tulip 134th	Farm Home for Boys, Westbrook	6,655·0	326·777	Mornmoot Clementine's Valour
Trecarne Golden Tot 4th	T. A. Petherick, Lockyer	4,991·65	257·748	Trecarne Some Duke
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Kathleigh Peggy	F. W. Kath, Dalby	6,963·3	395·819	Kathleigh Silver Victory
Westwood Kelos	F. Porter, Cambroon	5,534·35	357·684	Trecarne Golden King 2nd
Lermont Myrtle 2nd	J. Schull and Sons, Oakey	6,624·9	321·33	Lermont Ambassador 2nd
Lermont Mischief	J. Schull and Sons, Oakey	5,978·85	316·307	Trinity Noble Effort
Lermont Golden Lily	J. Schull and Sons, Oakey	5,462·55	302·063	Trinity Noble Effort
Grasmere Victory's Carina	F. Eager, Petrie	6,672·95	289·697	Oxford Brown Victory
Westbrook Sultane 9th	Farm Home, Westbrook	6,180·25	285·187	Westbrook Ambassador 52nd
Nairfale Mayday	R. J. Browne, Yangan	5,154·8	274·306	Nairfale Count Paymaster
Linden Grove Laura	F. McGrath, Kin Kin	4,767·6	255·488	Linden Grove Laddie
Romsey Peach Bud	J. Wilton, Killarney	4,779·2	254·916	Oxford Pixie's Victor
Linden Grove Petal	F. McGrath, Kin Kin	4,537·3	241·291	Linden Grove Laddie
Trecarne Dairy Queen 3rd	T. A. Petherick, Lockyer	4,807·55	238·272	Trecarne Some Duke



[*Photograph, Department of Agriculture and Stock.*

Plate 48.

FAT CATTLE ON KINGPAH PASTURES.—The property of Mr. J. Faulkner.



Sheath Rot (Posthitis) of Sheep.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

SHEATH rot is a disease of wethers and rams with which most sheep men are familiar. It is often referred to as pizzle rot or balanitis, although these names are not really correct as the disease commences on the sheath and the other organs may become involved secondarily.

The disease can cause serious economic loss, for up to 40 per cent. of a flock of wethers have been affected. Animals suffering from the disease lose weight rapidly and are often attacked by blow flies. Few deaths result directly from the disease, but, if a heavy wave of blow-flies occurs concurrently with an outbreak of sheath rot, severe losses may ensue. The disease can cause considerable inconvenience and expense, as it may mean extra handling of sheep. In addition, rams as well as wethers may be affected.

Sheath rot occurs extensively in Queensland. It is particularly prevalent in the so-called "desert" country south-east of Hughenden and east of Barcaldine, and in other areas where "dry" sheep are run.

The cause of the disease is not known despite considerable work done in Australia and in other parts of the world. Practical means of controlling the disease are, however, available.

Course of the Disease.

Most woolgrowers become aware that the disease is occurring amongst their sheep when they find sick animals. By this time the condition is usually well advanced.

If careful observations are made it will be seen that the disease commences as a small scab-like ulcer which may be located on or near the opening of the sheath. This scab may remain more or less "dormant" for some time or may extend fairly rapidly. When this occurs, the whole of the sheath becomes enlarged and red. The animal may experience difficulty in urinating and a close examination will reveal that in many cases the sheath contains pus and the penis itself may be involved. When this happens to rams it is particularly serious.

Because of the irritation and pain the affected sheep become uneasy and may kick at its belly, or attempt to bite at the affected part.

Treatment.

A considerable amount of research work has been done by the C.S.I.R. on the cause and treatment of sheath rot. During these investigations it was considered desirable to send affected sheep from

Western Queensland to the McMaster Laboratory in Sydney by train. Almost without exception these animals recovered within about ten days of their arrival in Sydney. The factors in the rapid recovery were examined and it was found that fasting affected animals, as would occur in a long train journey from western Queensland to Sydney, brought about rapid return to health in the majority of cases.

Under field conditions the sheep should be starved by being confined in a small bare holding paddock for about a week or ten days. Ample water should be available during the whole of this period. The exact technique used may be varied somewhat by allowing restricted grazing just to keep the sheep going during the last two or three days. It was found in the experimental work that it was possible to starve the sheep for ninteen days without any untoward results, except of course a loss of weight. Accordingly, animals which do not respond to the initial treatment may be drafted off and their period of starvation extended.

It has been found that a few cases may not respond to starvation, and with these it is necessary to resort to medical and surgical treatment. This consists of slitting the sheath, for which a long pair of scissors with one blunt (or ball) pointed blade may be used. The affected area is then irrigated with a solution of 2 per cent. (1 in 50) copper sulphate or 10 per cent. copper sulphate ointment may be applied after the pus has been removed from the affected parts.

THE MILCH GOAT—HINTS ON MILKING.

Goats should be milked twice a day, or as near twelve-hour intervals as practicable; heavy producers may require three milkings. Regularity of milking is a big factor in keeping up the milk flow. The manner of milking is also important if the milk supply is to be maintained and that very delicate organ, the udder, kept in good shape. Cleanliness of the udder and milking utensils is necessary to obtain milk that will keep.

Goats should be taught to stand quietly whilst being milked. To facilitate the milking, a stand 18 inches off the ground, upon which the goat soon learns to stand, is useful. If the goat will not stand quietly on the platform during milking, her head should be secured either by strap and short chain, or in a miniature cow bail.

The udder should be washed with clean, tepid water before milking, as should the milker's hands, which should be dried. Milking with wet hands is undesirable and unhygienic. The goat may be milked either from the rear or on the side, but whatever method is adopted should be adhered to as a routine. Both teats should be grasped gently but firmly with the hands and all the fingers closed and opened without pulling down at all. Some milkers advocate a slight upward push before each flow. Stretching the teats each time is bad milking. This method is suitable when the teats are large, but if the teats be small, the milking has to be done by stripping. In this method, the teat is grasped between the first finger and the thumb, close to the udder. The hand is drawn down the teat to cause the milk to flow with the motion of the hand.

Whatever method is used, it is very important to strip the udder of all milk. To do this, imitate the kid, which pushes and rubs the udder. Then with finger and thumb, strip the last few ounces from the udder. Milk the animal as quickly as possible. To get the best results, practice quickness, quietness, and gentleness.

Lanolin spread on the teats before milking often helps to allay any tenderness, and aids the milking of small-teated young goats. Should goats kick when being milked, examine the udder for long hairs, which should be cut off. Also see that the milker's fingernails are well trimmed, otherwise sore udders may result.

MARKETING

Production Trend Reports.

Monthly reports on production trends of important primary commodities instituted by the Minister for Agriculture and Stock early in the year have been well received.

The reports which are in the form of a stencilled pamphlet containing nine or ten pages are obtainable free upon application to the Department. They contain much information of value to organisations and firms supplying products or services to farmers as well as to farmers themselves.

The service will be extended from time to time and eventually detailed forecasts of the production of different crops will be included.

The report is widely distributed, copies being sent as far afield as London, and from the continuous inquiry it is apparent that there has long been a demand for this kind of information, which it is only possible to obtain through a service such as that now being conducted by the Marketing Division of the Department.

Throughout the farming areas of the State, with the exception of the Far North, where some substantial falls were recorded, the rainfall during July was considerably under average. Most of the southern districts, including the Darling Downs, received less than half an inch for the month.

Dairy cattle were in fair to good condition. There had been a marked drying off of herbage and pastures, and growth of winter fodder crops had slowed; but, because of the low winter rainfall, weed taints, usually prevalent and the cause of much down-grading of cream at that time of the year, were causing little trouble.

On the Darling Downs, the sowing of wheat for grain was completed. Germination was excellent and on most lands subsoil moisture had been sufficient for satisfactory early growth. Early rains were needed for adequate further development.

Planting of sugar virtually ceased during the month and young crops made little progress. Further deterioration in the crop occurred at Mackay, and prospects in the Bundaberg mill areas were less promising. All mills north and inclusive of the Lower Burdekin had commenced crushing and early ccs and condition of the cane were fairly good.

Harvesting of cotton was still in progress during July in the Callide Valley, where the weather conditions had been conducive to the production of good grades.

Intake of eggs by the South Queensland Egg Marketing Board for July was 635,473 dozen, which compares very favourably with 494,384 dozen for July, 1946.

Comparative Prices, Australian and Cuban Sugar—A Correction.

In the article on Empire Preference on Rural Products in the June issue of the Journal, the last paragraph of the section dealing with sugar, page 370, contained the following statement:—

> "even with the present general shortage of sugar, the current Cuban export quotation is about the same as the wholesale home consumption price in Australian capital cities, £33 4s. per ton."

The General Secretary of the Queensland Cane Growers' Council has since drawn our attention to the fact that the present export price of *raw* sugar from Cuba is approximately £9 per ton in excess of the price for Australian *raw* sugar. The comparison as made in the article referred to was, therefore, not between the value of raw sugar in Cuba and the value of raw sugar in Australia, but between the price of *raw* sugar in Cuba and the wholesale price of *refined* sugar used for home consumption in Australia, viz., £33 4s.

Latest overseas reports record that odd parcels of Cuban raw sugar recently sold at up to £47 per ton, which figure is well over £20 in advance of the price received by the Australian sugar industry for that portion of the raw sugar produced and refined for home consumption.

GENERAL NOTES

Staff Changes and Appointments.

Mr. G. R. Moule, B.V.Sc., Veterinary Officer attached to the Sheep and Wool Branch of the Department of Agriculture and Stock, has been appointed Officer in Charge of the Sheep and Wool Branch, Division of Animal Industry.

Mr. V. R. Smythe, Assistant Dairy Technologist, has been appointed Dairy Technologist in the Division of Dairying, Department of Agriculture and Stock, Toowoomba.

Central Queensland Egg Marketing Board.

Regulations have been issued under the *Primary Producers' Organisation and Marketing Acts* authorizing The Central Queensland Egg Marketing Board, in certain cases, to exempt egg producers in its area from the requirement to deliver eggs to the Board. The Board may, in its discretion, grant exemptions in respect of eggs required as food for a grower's family and for the hatching of his own flocks and in respect of sales to retail vendors. It will be a matter for the Board, within the framework of the Regulations, to determine its own policy in respect of exemptions.

Sir John and Lady Higgins Research Scholarship.

Applications are invited by the University of Melbourne from graduates in science, agricultural science, and veterinary science for the Sir John and Lady Higgins Research Scholarship. Intending candidates must have had at least one year's experience in research work, or one year's advanced training after qualifying for the first degree. Candidates who will have completed one year's post-graduate studies in research by December, 1947, are eligible to apply.

The scholar will be required to carry out research work in industrial chemistry and biochemistry as related directly to the study and the development of the pastoral and agricultural industries of Australia. Preference will be given to graduates in agricultural science and veterinary science provided that after graduation their work has been in chemistry or biochemistry.

The scholarship is valued at £400-£500 and is awarded for two years. Travelling or other expenses may also be paid at the discretion of the Professorial Board, under whose direction the work will be carried out. The selected scholar will be expected to take up the tenure of his scholarship in March, 1948.

Applications should reach the Registrar, University of Melbourne, Carlton, N.3, not later than 15th August.

Central Queensland Egg Board.

Egg producers in Central Queensland, with the assistance of the Marketing Division of the Department of Agriculture and Stock, have established a producer-controlled marketing board for eggs in the region extending from Bundaberg to Mackay. In this area, there are approximately half a million head of poultry. The Board has assumed control as from the 1st July and has arranged with the Central Queensland Meat Export Company at Lakes Creek, Rockhampton, to act as its agent in the receiving, handling, and marketing of eggs. Producers in this area now control their own industry in their own interests and thus will be in a position to assist in placing their industry on a firmer footing.

Banana Levy.

The Executive Council has approved of the issue of an Order in Council under the *Banana Industry Protection Acts* providing for a levy on banana growers, the proceeds from which will be used for the maintenance of the Banana Industry Protection Board. The levy, which will operate from the 26th August, is at the rate of 1½d. per case containing 1¼ bushels or less for bananas marketed in the case; and 2d. in the £1 or part thereof on the gross proceeds of sales of bananas marketed in the bunch. In respect of bananas marketed elsewhere than in Queensland, the sum of 2s. 10d. a ton is added to the freight charges.

Rural Topics

Feed for Pigs.

Because the pig will eat classes of food which otherwise would be of no economic value on the farm, it is looked upon as a scavenger, and many articles of food are fed to it in a putrefying or mouldy condition. Not only are foods in such a state a fruitful source of disease, but the flesh of the animals so fed will be of poor quality. The quality of the bacon depends upon the food given, and first-class flesh cannot be expected from pigs not suitably fed.

Skim milk and butter-milk are excellent foods if fed while fresh and sweet, but to store them in insanitary tanks, casks or other containers until they are semi-putrid is merely to invite trouble. Where swill and hotel refuse is collected for food it should be fed before it becomes soured, since there is great danger of poisoning from soured swill. In addition, it should always be boiled before use. Fruit, vegetables, and root crops when rotting are also a common source of digestive derangements, while maize fed in a mouldy condition may cause poisoning and nervous disorders. The danger of sickness may be lessened in all these cases by boiling the food before giving it to the pigs.

Signs of Good Lucerne Seed.

Indications of Freshness.—Lucerne seed should be bright, fresh to the smell, and of a yellowish-green colour, these characteristics indicating that it is not old seed; the latter can nearly always be picked by the absence of a good smell, and a brown, "aged looking" colour. Provided it is properly stored, lucerne seed retains its viability for a considerable time; seed two or three years old may germinate nearly as well as new seed, but it may not have the vigorous and rapid germinating ability of the latter.

When purchasing lucerne seed, examine it closely for shrivelled and cracked grains if it has been produced in a dry climate, whilst samples containing weed seed should be looked at askance, especially if the lucerne is to be grown under irrigation.

Maintenance of Quality in Cream.

Ability to maintain quality in cream during the summer months depends primarily upon:

1. General dairy cleanliness.
2. Removal of the animal heat from milk or cream by means of water cooling as soon as possible after it is produced.
3. Maintenance of the fat test of cream at about 40 to 42 per cent., in order that a minimum amount of skim milk is present in the cream.
4. Blending of cream from different milkings only after it has been cooled.

A Warm-Hearted Country.

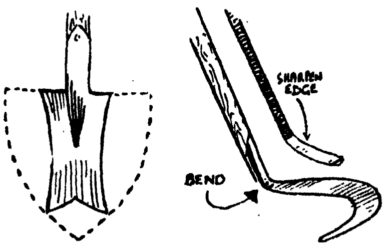
"England is a country of warm-hearted people always eager to help. The little apparent coolness at the start arose out of good manners—not wanting to interfere with someone else's business." Mr. A. E. Hyland said that at a recent meeting of the Australian Dairy Board when he was telling of his experiences in the United Kingdom during twelve years as Director of Australian Overseas Publicity. "Apart from any sentimental feelings," he added, "it would be a wise thing to preserve our attachment to this great and powerful family spread over all the world. Whilst we remained part of this powerful band of big brothers, the rest of the world would have to take notice of us."

Taking a Rise Out of the Cow.

Sometimes when driving a cow, or attempting to lead her, she will lie down and refuse to get up, and the same thing may happen when you try to lead her into a truck. She will get up quickly, however, when the palms of the hands are placed over her nostrils, with the fingers under the jaw tightly enough to stop her breathing.

GADGETS AND WRINKLES

IDEAS FOR ERADICATING BRACKEN.



There are various useful ideas in operation such as stock trampling and eating; top-dressing and sowing pastures is also of value. There is also, of course, the Gippsland hook, which is very effective, and in this connection, some find it an advantage to bend same over as shown in this sketch.

A good implement can also be made from an old shovel—the illustration showing how it should be cut—the dotted lines showing the original shape and the firm lines the finished shape of the "slasher." The fish-tail end will also be noted. It should, of course, be sharpened, and, if necessary, the handle can be altered to suit.

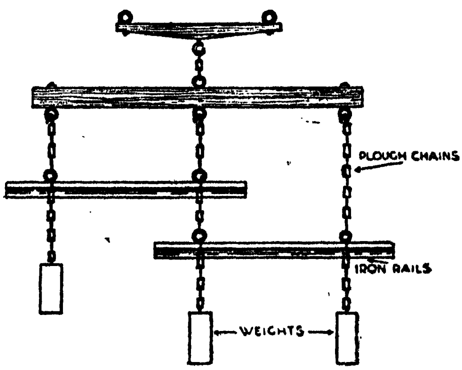
Another idea is to always carry a bent stick whenever walking through bracken infested country and, if a collection of these sticks is kept in a handy place, they will be found of very great use. A sample stick is shown in the sketch.

ANOTHER METHOD.

This also comes from Scotland, and experience has shown it to be very effective—good results being obtained by bruising, which can be done with this home-made implement in preference to cutting.

It can be cheaply made but the drag bars must be heavy and, if possible, with concave facing or edges. The sketch shows two drags attached but three or four could be used if the ground is not too rough or hilly.

The scientific idea behind bruising seems to be that bleeding of the underground rhizomes continues over a long period, causing impoverishment at the roots, whilst the damaged fronds allow disease and parasites to interfere with the root system.



—*From "Handy Farm and Home Devices and How to Make Them."*
(J. V. Bartlett for War Blinded Association, Adelaide, S.A.), 1946.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

DIARRHOEA IN BABIES AND CHILDREN.

WE will assume that a diagnosis of diarrhoea in an infant or child has been made and the baby has been taken off all milk and other foods for the necessary period.

It is most important that baby has plenty of fluid during this period—boiled water at the rate of 2½ to 3 oz. for every pound of body weight should be given in 24 hours, so that if baby weighs 10 lb. he will need 25 to 30 oz. of boiled water each day given as often as he will take it. Barley water may be used instead—the older baby may take this better, and after the first day sugar of milk or a glucose preparation at the rate of one tablespoon of sugar to every 12 tablespoons of boiled water or barley water should be added. When baby shows signs of improvement—his temperature is normal again, his motions are not offensive, and he looks better, he must be carefully graded back on to food. *And this is the time when most mistakes are made and serious relapses may be caused.* If at all possible mothers should seek the guidance of the sister at their nearest Child Welfare Centre at this period and not try to manage alone. If baby is under a doctor's care he will of course continue to supervise the feeding and general management until baby is well, but mothers often visit their doctor or a centre once or twice only and then go their own way. In a severe case of diarrhoea this may have grave consequences. *The important part of the treatment of diarrhoea, and particularly infective diarrhoea is that the baby shall be under skilled supervision until he is back on to his usual diet and is digesting it well.* For the benefit of mothers who are beyond the reach of medical help a few general rules may be laid down.

Breast Fed Babies.

In the first place it is most unusual for breast fed babies to contract infective diarrhoea, and so the mother who is feeding her own baby has little to worry about in an epidemic, provided she does not give her baby a dummy or is careless in personal hygiene. If through some mischance baby does become infected it is ever so much easier to grade him back on to food. After the initial period of starvation, which may only need to be 8 or 12 hours, he may have a breast feed for say two minutes every 4 hours followed by a drink of barley water. Increase the feeds by one or two minutes every day or alternate day depending on the speed with which baby recovers until he is back on his full feeds. Keep up the supply of water.

Artificially Fed Babies.

To grade these babies back on to food the greatest care must be taken. The experience of this service is *that the majority of relapses occur from introducing milk and milk foods too soon and increasing the strength of the milk mixture before baby's digestion can deal with it.* A rapid increase in the feeds, even when baby appears to be much better, will very often result in a relapse.

If baby is under 9 months it is advisable to add one or two teaspoons of milk to each 3 or 4 hourly feeding of sweetened barley water to see how baby re-acts. Make an increase every *alternate* day to give baby's digestion time to adjust itself to each change and watch the motions carefully. The amount may be doubled every alternate day. If, as the milk is increased, it is not well tolerated, the addition of a pancreatising agent, such as Benger's Food, is often useful particularly for older babies. Dried milks may be Bengerized if these are used. Baby should in this manner be graded carefully back to the food he was having before he became ill, provided he was doing well on it.

Toddlers.

After the initial starvation the child may have water food, sago, or arrowroot well cooked and flavoured with a little syrup, sugar, meat extract, or orange juice, or grated raw apple or baked apple may be given 2-hourly as much as the child will take. In a day or two give a rusk or crisp baked bread without butter once or twice a day. Marmite or Vegemite broth may be added next, and later this can be thickened with potato baked or boiled in its skin (no butter). Milk should be introduced later and with care, and can with advantage be diluted and Bengerized for a few days. Remember unless baby can digest a food it is no use to him, and merely overtaxes his already weakened digestion, so go carefully always, and if possible have expert guidance.

Further advice on this and other matters can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

THE FARM GARDEN.

If animal manure in quantity is not available, an efficient system of soil management in the garden will include the growth of green manures for digging under. Green manures serve the purpose of conserving the mineral matter of the soil, increasing the amount of combined nitrogen, and counterbalancing the continuous diminution in organic matter due to bacterial action.

The more immature the green crop and the lighter textured and better aerated the soil, the more rapidly is the material decomposed. The period that elapses between the digging under of the green crop and the planting of a new crop should not be so great that the nutrients, which are rapidly liberated once decomposition begins in the soil, are lost. In gardening practice where sandy or heavy soils require organic matter in quantity for the improvement of their texture, the practice of green manuring alone is insufficient to ensure this effect, though its value in providing rapidly available nutrients is considerable.

Succulence and the nitrogen content of green manures determine the rate of release in usable form of nitrogen from its compounds present in the growing plant. Fibrous legumes, or legumes poor in nitrogen as occur when grown on poor acid soils lacking the appropriate organisms for nodule production, may deplete the soil of nitrogen suited to plant nutrition for several weeks or months. When legumes of correct maturity and nitrogen content are turned under, an ample release of nitrogen may be in evidence in moist soil in two weeks' time. Where favourable results are expected of green manure crops, nitrogenous fertilisers should be applied to non-legumes, and ample minerals, a favourable degree of acidity and the correct organisms for inoculating must be provided for legumes.

With the enthusiasm of spring, most of the space is utilised in the majority of gardens, but any areas which are not used in autumn or winter can be put under a green crop. A hardy and useful crop for the garden is a mixture of wheat and vetches, broadcast with superphosphate over the prepared ground, and then raked in or turned under to a depth of 1 or 2 inches with a spade, taking a shallow horizontal slice and inverting. Other quick-growing and useful crops are New Zealand blue lupins, field peas and tick beans, which may be grown alone or mixed with a cereal. The rapidity of growth of these crops, under good conditions, makes them useful for growing in the interval between crops.

QUEENSLAND WEATHER IN JULY.

Except for slightly over average rain totals at a few places on the far North Coast fringe and over average showers of 53 points at Hungerford, marked deficiencies were general in all districts with Nil reports in the Carpentaria, Central and Lower West, Central Lowlands and Highlands to the Central and Coast sections. A few light showers were received in parts of the far South-West, Warrego and Maranoa and in the Downs and South Coast districts; the only light to moderate showers with isolated thunder and hail were reported on the morning of the 23rd. Rainfall distribution throughout most of the State has steadily deteriorated since May, though in parts of the South-West 1 to 2 inches were recorded in June. In the farming and dairying areas of the South-East Divisions the promising outlook at the end of May has not been consolidated by any useful rain in June and July, and an early general soaking distribution is required. Frosty night conditions have also assisted in the drying up of pastures and caused local vegetable and cane crop damage. Crops and pastures in the Central Coast East also require more rain and many pastoral areas in the Central West, Central Interior, Lowlands and Highlands to the Central Coast West are experiencing hard wintering conditions as they missed the March rains which benefited most of the Carpentaria and southern inland divisions.

Pressure.—As in June the continental high pressure belt continued as the chief control with a series of fairly substantial centres moving from west to east across the centre of the Continent. Movement of the front of these "highs" brought fresh south-east winds at times along the tropical Queensland coast. Considerable activity was maintained in the low pressure belt to the south of the Continent, but there was little inland penetration of the fronts and centres. Only very weak trough formations were shown in Queensland and there was a complete absence of any out of season inflow of air from the north. A combination of inland trough, cold front and southern "low" on the 21st produced the light to moderate rain in the south-east districts, but the next similar distribution on the 26th moved too quickly for rain production in southern Queensland.

Temperatures.—Mean maximum temperatures were above average from approximately 0.3 deg. at Cairns and Thargomindah to 2.7 deg. at Georgetown and Mitchell. Minimum temperatures were slightly above normal at Cairns and Longreach but otherwise below 4.3 deg. at Rockhampton and 2.9 deg. at Mitchell.

Frosts.—There were many sharp frosts in the south-east quarter with cold night temperatures penetrating well northward into the Central Coast and Tropical Interior. Many stations in the Maranoa and Downs recorded 30 deg. and under grass minimum readings on over 20 nights, Stanthorpe 25 (13 deg. on 20th), Bybera 24 (11 deg. on 20th), Mitchell 20 (15 deg. on 20th), Tambo 18 (15 deg. on 30th), and Winton 29 deg. on 18th.

Brisbane.—Mean pressure $\frac{9+3}{2}$ 30.095 inches (normal 30.078 inches).

Temperatures.—Mean maximum 70.1 deg. (normal 68.5 deg.); mean minimum 46.4 deg. (normal 48.8 deg.); mean temperature 58.3 deg. (normal 58.7 deg.). Highest daily reading 74.9 deg. on 5th, lowest daily reading 40.0 deg. on 13th.

Rainfall.—34 points on 1 day (average 216 on 8 days). Lowest number of days rain in July since Nil in 1841. *Sunshine.*—266.5 hours (52.2 above normal). *Frosts* (suburbs) 17 nights (record highest). 25 deg. on grass at Archerfield on 18th. *Fogs* (3, general). *Mist patches* 9.

The rainfall position is summarised below—

Division.	Normal Mean.	Mean July. 1947.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	42	21	50 below
Peninsula South	24	Nil	100 ,,
Lower Carpentaria	20	Nil	100 ,,
Upper Carpentaria	42	Nil	100 ,,
North Coast Barron	114	118	4 above
North Coast Herbert	179	93	48 below
Central Coast East	111	4	96 ,,
Central Coast West	65	Nil	100 ,,
Central Highlands	116	7	94 ,,
Central Lowlands	82	Nil	100 ,,
Upper Western	41	Nil	100 ,,
Lower Western	51	1	98 ,,
South Coast, Port Curtis	178	24	87 ,,
South Coast, Moreton	227	24	89 ,,
Darling Downs, East	181	49	73 ,,
Darling Downs, West	141	30	79 ,,
Maranoa	147	17	88 ,,
Warrego	107	26	76 ,,
Far South-West	69	18	74 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

SEPTEMBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.03	5.33	Cairns	27	31	Longreach	34	36
6	5.58	5.36	Charleville	27	27	Quilpie	35	35
11	5.52	5.38	Cloncurry	48	52	Rockhampton	9	11
16	5.46	5.40	Cunnamulla	29	29	Roma	17	17
21	5.40	5.42	Dirranbandi	19	19	Townsville	22	27
26	5.35	5.45	Emerald	18	20	Winton	38	42
30	5.30	5.46	Hughenden	33	37	Warwick	3	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	6.02	6.29
2	6.57	7.00
3	7.52	7.31
4	8.49	8.01
5	9.48	8.34
6	10.49	9.08
7	11·53	9.48
8	..	10.34
	a.m.	
9	12.59	11.27
		p.m.
10	2.04	12.28
11	3.05	1.35
12	4·00	2.44
13	4.48	3.54
14	5.30	5.01
15	6.08	6.06
16	6.44	7.09
17	7.17	8.10
18	7.51	9.10
19	8.27	11.09
20	9.05	11.07
21	9.46	..
		a.m.
22	10.31	12.04
23	11.20	12.59
	p.m.	
24	12.12	1.49
25	1.06	2.35
26	2.02	3.17
27	2.58	3.55
28	3.53	4.29
29	4.49	5.01
30	5.45	5.32

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	23	14	39	30	14	5	45	34
6	13	25	28	41	3	16	31	47
11	10	29	25	44	0	20	27	52
16	19	19	35	34	10	10	39	39
21	29	10	44	25	19	0	52	28
26	27	12	43	26	18	1	51	29
30	19	18	35	33	10	9	41	38

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	38	17	56	42	41	27	32	16
3	28	28	50	49	34	34	24	24
5	18	38	42	56	27	41	16	33
7	9	47	37	62	21	47	8	39
9	6	53	35	66	20	51	6	44
11	5	52	35	65	19	50	5	44
13	12	44	38	60	23	46	11	37
15	22	32	45	53	30	38	19	28
17	34	22	53	45	38	30	28	19
19	43	11	60	38	45	23	36	11
21	52	5	66	34	50	20	43	6
23	55	3	68	32	51	18	45	4
25	52	5	66	34	50	20	43	6
27	48	11	63	38	48	23	40	11
30	30	25	51	47	35	32	25	22

Phases of the Moon.—Full Moon, September 1st, 2.34 a.m.; Last Quarter, September 8th, 1.57 p.m.; New Moon, September 15th, 5.28 a.m.; First Quarter, September 22nd, 3.42 p.m.; Full Moon, September 30th, 4.41 p.m.

On September 24th, at 7 a.m., the Sun will cross the Equator on its apparent journey from north to south. On this day it will rise and set at true east and true west respectively. On September 3rd and 16th the Moon will rise and set approximately at true east and true west.

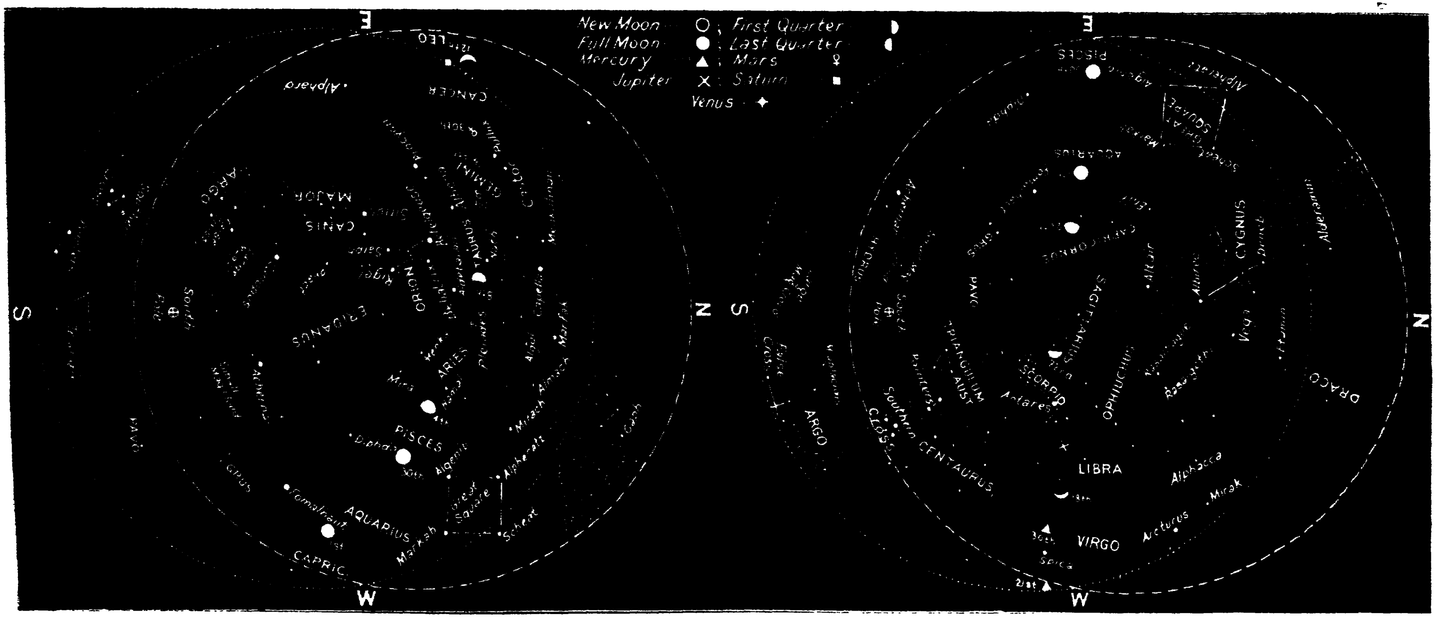
Mercury.—An evening object all this month. On the 1st, in the constellation of Leo, it will set 10 minutes after the Sun and by the 30th, in the constellation of Virgo, will set 1 hour 40 minutes after sunset. On the 26th it will pass 1 degree to the north of Spica.

Venus.—Too close in line with the Sun for observation, being in conjunction with the Sun on the 3rd.

Mars.—In the constellation of Gemini, at the beginning of the month will rise between 2.45 a.m. and 4 a.m. and at the end of the month will rise between 2 a.m. and 3.15 a.m. It will pass 6 degrees south of Pollux on the 20th and by the end of the month will be in line with Castor and Pollux.

Jupiter.—Well up in the sky at nightfall. At the beginning of September will set just before midnight and at the end of the month will set between 9.30 p.m. and 10.30 p.m.

Saturn.—May now be seen low in the east during morning twilight. In the constellation of Leo, at the beginning of the month it will rise about 1 hour before the Sun and at the end of the month it will rise 2 hours 15 minutes before the Sun.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th September. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold N at the bottom; when facing south hold S at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another moving east to west arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the Moon and planets which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JULY RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July,	No. of years' records.	July, 1946.	July, 1947.
	In.		In.	In.
North Coast.				
Atherton	1·12	42	0·50	0·79
Cairns	1·53	61	0·98	1·40
Cardwell	1·38	71	0·06	1·00
Cooktown	0·98	67	1·26	1·74
Herberton	0·89	57	0·54	0·40
Ingham	1·69	51	0·12	0·79
Innisfail	4·75	62	1·37	2·84
Mossman	1·19	19	1·01	1·73
Townsville	0·67	72	0·01	..
Central Coast.				
Ayr	0·73	56	..	..
Bowen	0·93	72	0·16	0·08
Charters Towers ..	0·67	61	0·10	..
Mackay	1·64	72	0·24	0·18
Proserpine	1·58	40	0·24	0·63
St. Lawrence ..	1·36	72	0·07	..
South Coast.				
Biggenden	1·41	44	0·10	0·37
Bundaberg	1·83	60	0·17	0·22
Brisbane Bureau ..	2·16	95	0·19	0·34
Caboolture	2·37	67	0·13	1·22
Childers	1·70	48	0·18	0·22
Crohamhurst	2·90	50	0·52	0·17
Esk	1·90	56	0·30	0·08
South Coast—contd.				
Gatton College ..	1·37	74	0·26	..
Gayndah	1·47	72	0·46	0·09
Gympie	2·07	73	0·34	..
Kilkivan	1·50	62	0·31	0·15
Maryborough ..	1·93	72	0·09	0·02
Nambour	2·67	47	0·60	0·87
Nanango	1·65	61	0·74	0·20
Rockhampton ..	1·73	72	0·11	0·11
Woodford	2·28	55	0·18	0·15
Darling Downs.				
Dalby..	1·71	73	0·32	0·08
Emu Vale	1·57	47	0·10	0·42
Jimbour	1·48	64	0·28	0·18
Miles	1·62	58	0·36	0·05
Stanthorpe	2·00	70	0·35	1·16
Toowoomba	2·06	71	0·43	0·16
Warwick	1·80	78	0·05	0·55
Central Highlands.				
Clermont	1·06	72	..	..
Springsure	1·18	74	..	..
Maranoa.				
Roma	1·43	69	0·05	..
St. George	1·21	62	0·03	0·41

CLIMATOLOGICAL DATA FOR JULY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Coastal.									
Cairns	..	79	63	81	5, 6, 7, 11, 15, 17, 23, 28	56	11	140	8
Herberton	..	73	49	82	14	37	18	40	6
Townsville	..	78	57	82	16, 17	51	24	..	..
Brisbane	30·14	70	46	75	5	40	13	34	1
Rockhampton	30·14	76	46	83	15	36	30	11	1
Darling Downs.									
Dalby	..	67	35	76	4	26	21	8	2
Stanthorpe	..	59	30	68	4	19	20	116	2
Toowoomba	..	62	38	71	4, 26	29	20	16	2
Mid-Interior.									
Georgetown	30·04	85	53	90	10	44	23	..	..
Longreach	30·17	76	45	87	13	34	18	..	..
Mitchell	30·20	69	35	78	4, 13, 14	25	20, 21	..	..
Western.									
Burketown	..	84	56	92	10	47	19	..	..
Boulia	30·12	75	..	87	4, 13	..	..	..	..
Thargomindah	30·13	66	41	80	13	35	18, 20, 30	30	3

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

Volume 65 Part 3

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Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

QUEENSLAND AGRICULTURAL JOURNAL

Volume 65 1 SEPTEMBER, 1947 Part 3

Event and Comment.

Farm Exhibits at the Brisbane Show.

IN former years the open farm crop section was a very popular feature of the Brisbane Exhibition. As promoting friendly rivalry among competing farmers of various districts of Queensland and Northern New South Wales, the value of this open section educationally and otherwise was undoubted. Its omission this year was, therefore, regretted and it is hoped that the Royal National Agricultural Society will see its way clear to restore it in future show schedules.

This year there were only four district exhibits, three from Queensland and one from New South Wales and all of A grade. An immense amount of work had been put into the preparation of these exhibits and in each the handiwork and skill of the woman as well as the man on the land were strongly evident. West Moreton gained the first award and all associated with the other district displays merited high commendation for their array of rural wealth, industry, and enterprise.

The varieties of chaff and baled hay, especially lucerne, both green and sweated, were excellent; and it was good to see samples of the lesser used but nevertheless important chaffs, such as white panicum, sudan, and some of the introduced grasses. The baled hays also were generally well prepared. The sheaves of oats and wheats were representative of a number of varieties, but while well cured and of good quality they were not as attractive in get-up as the baled hay.

The grains, with one exception, were not as good as those shown in former years. The exception was the maize, both ears and grain, in the New South Wales exhibit in which every entry was an excellent specimen of the variety it represented. In some of the other district

exhibits the grain and ears also were of good quality, although some of the varieties were off type and incorrectly named. The wheat was much below the usual high standard in the Brisbane Show, because no doubt of the unfavourable season for grain growing last year, when crop yields in Queensland were the lowest for a very long time. The oats and barley entries were up to their usual high standard.

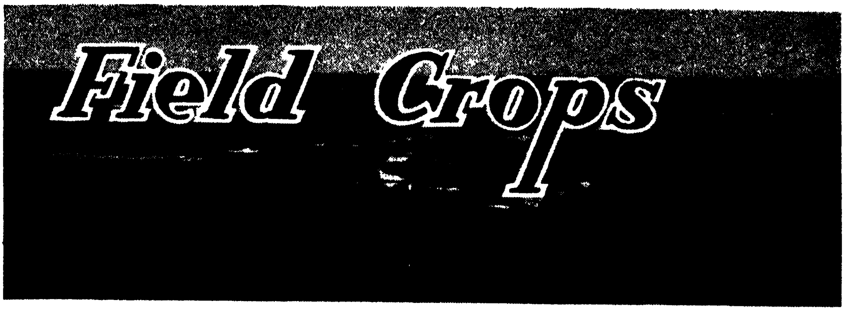
The potato exhibits in each district display were very good examples of a wide range of varieties and those from North Queensland merited particular attention. Until recently, potato growing in the North was only on a very small scale, but after the entry of Japan into the war northern farmers did a grand job in producing some thousands of tons a year. The value of this national service cannot be over-estimated, for not only were supplies produced for Army requirements but shipping and rail space, which otherwise would have had to be used for the carriage of potatoes from the south, was conserved for the transport of war material for defence forces in advanced areas.

Sweet potatoes also were prominent in each section and included many varieties for both table and stock use. It is often wondered if the average housewife appreciates to any extent the food value of a good sweet potato for culinary use. If the best varieties were marketed for the table, any prejudice against them as a menu item would soon be dissolved. Pumpkins made up another attractive display. Of the table varieties, the Beaudesert or "Queensland Blue" had pride of place. The pumpkin crop is now an important one in this State and is only exceeded in annual value by five or six other field crops.

The wide range of fodders shown indicated the fertility of the country on which they were grown. In addition to the greens and grains, there were several kinds of ensilage of good quality, including trench-conserved material.

Among other crops staged in the district exhibits tobacco, cotton, and peanuts claimed close attention. Perhaps greater prominence could have been given to these entries, especially in the North Queensland and Darling Downs sections—two of the principal tobacco districts in Australia—for each has obviously a big future in our agricultural economy. According to the recent report of the Commonwealth Mission of Investigation into the soy bean industry of the United States of America, all available evidence points to the desirability of our developing a more extensive vegetable oil industry and, consequently, to the necessity for an intensive research programme which would include additional industrial uses as well as plant breeidng and field trials. If undertaken, this work would no doubt cover other vegetable oil-producing plants besides those already established in Queensland agriculture. The field for the expansion of these important crops is very wide, particularly cotton, of which the present decline in cultivation is, it is hoped, only temporary. Apart from primary purposes and use in vegetable oil extraction, an expansion of cotton and peanut acreage would lead to an increase in the output of protein-rich stock foods which, is turn, would have an important bearing on increased dairy production. It is hoped, therefore, that these valuable crops will be given greater prominence in the district displays at future Brisbane Shows.

Generally, the regional farm exhibits were worthy of the richly fertile provinces they represented.



Some Aspects of the Problem of Soil Erosion Control in Queensland Cane Fields.*

W. J. S. SLOAN.

MANY of the cane growing areas of Queensland are subject to serious soil erosion. Cane is a moisture loving plant and its culture is carried on in a belt of country which is characterised by heavy to very heavy summer rainfall. Soil losses on sloping land within this belt are, consequently, often extensive. Very commonly the soil lost in erosion consists of the fertile surface layer which is higher in organic matter, nitrogen and other mineral plant foods than the underlying soil. Extra ploughings and cultivations are required to smooth out gutters and rills which form in fields, thus adding to the costs of seed bed preparation and the costs of cultivation in the growing crop. Unchecked, erosion inevitably leads to the development of uncultivable gullies and the throwing of land out of cultivation.

The illustrations accompanying this article show some evidence of soil erosion which is occurring in the Isis district.

Unfortunately, this district was particularly liable to severe erosion during the summer of 1946-47, because of the unusually large acreage of land which was in bare fallow, ready for late summer and early autumn planting. This position had been created by the severe drought of 1946, which killed much standing cane and left it unfit for harvest during the 1946 crushing season. Instead of ratooning cane so affected, many farmers, by various methods, incorporated the trash, cane stalks and stools in the soil and prepared for a new planting in 1947, thus exposing an abnormally large area to severe erosion. It is interesting to note that events have since indicated that the apparently dead stools were capable of satisfactory ratooning and that it was a mistake to plough out so many fields, when they could have been ratooned profitably at less expense than was required to prepare the land for planting.

A further cause of the widespread erosion in the Isis district was the fact that unusually heavy rains aggregating approximately ten inches in twelve hours were recorded on one day in mid-February, and then again a similar fall was experienced on 1st March, just after many fields had been worked up after the first destructive rain group. With such torrential rain and so many acres of bare loose soil exposed, heavy soil losses were inevitable.

* From the *Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

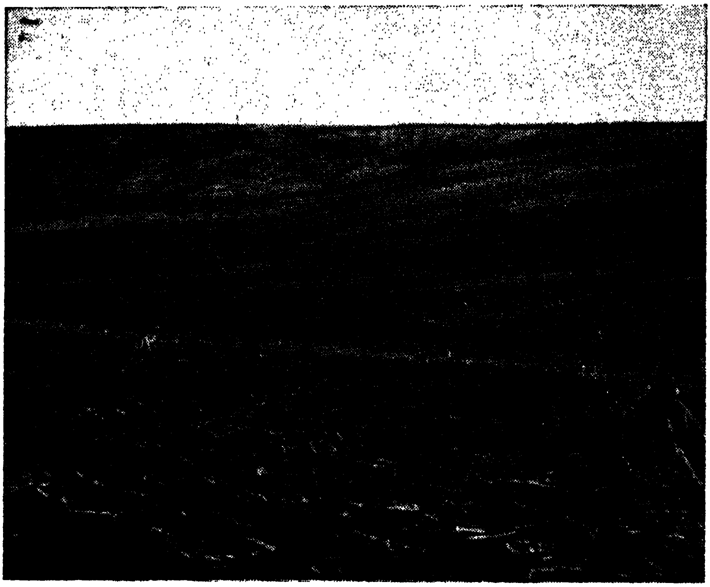


Plate 49.

SHOWING SEVERE EROSION DOWN TO THE PLOUGH SOLE ON HILLSIDES OF A CHILDERS CANE FARM.—Note the abundance of cane stalks in the soil in the foreground. These were residues from the previous dead cane crop which was ploughed in.

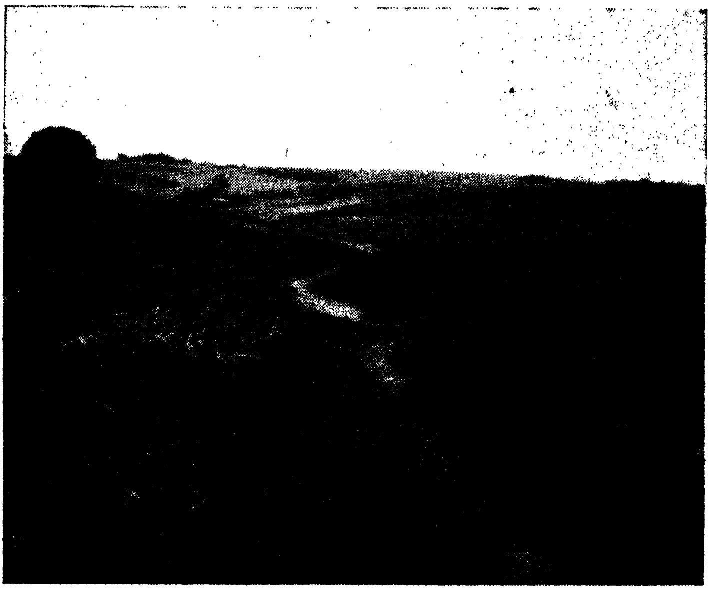


Plate 50.

AN ERODED GULLY IN THE FIELD SHOWN IN PLATE 49.

Perhaps one of the most spectacular effects of the heavy rain is shown in Figs. 100-103. These illustrate a strong dam which was built in a gully to check loss of soil from a cultivated field by causing silting of the channel. Logs of 30 feet length and 15 inches in diameter were placed across the gully and held in position by strong supporting posts. Galvanised iron was nailed on the upstream side of the logs to prevent seepage of water and silt through cracks between the logs, while on the waterfall side a concrete slab was constructed at the base to break the fall of the water and prevent scouring. This dam appeared to be quite strong enough to resist pressure from water which was likely to collect from rainfall on the catchment area *which was only about six to seven acres in area.* Figs. 102 and 103, however, show what happened after

Plate 51.

EROSION ON A SLOPE OF A CHILDERS CANE FIELD.—This slope was badly eroded after the mid-February rains in 1947, was re-worked and again eroded as illustrated after the early March rains.

the heavy rainfall of mid-February, 1947, and clearly illustrate the difficulty of economically checking erosion on land with a slope greater than 10 per cent. The rush of water down this comparatively short channel (Fig. 103) was sufficiently strong to carry one of the 30 feet logs a distance of 10 chains into a neighbouring cane field and to move pieces of concrete, two hundred weight or more in weight, at least two chains downstream. In addition, most of the silt previously caught and held in the dam was scoured out.

The field comprising the catchment area was lying in a roughly ploughed state prior to the rain and contained a large quantity of ploughed-in dead cane material left over from the previous harvest, particularly along the sides of the gully where much of the standing cane was unharvested in 1946 because it died in the drought. Absorption of the

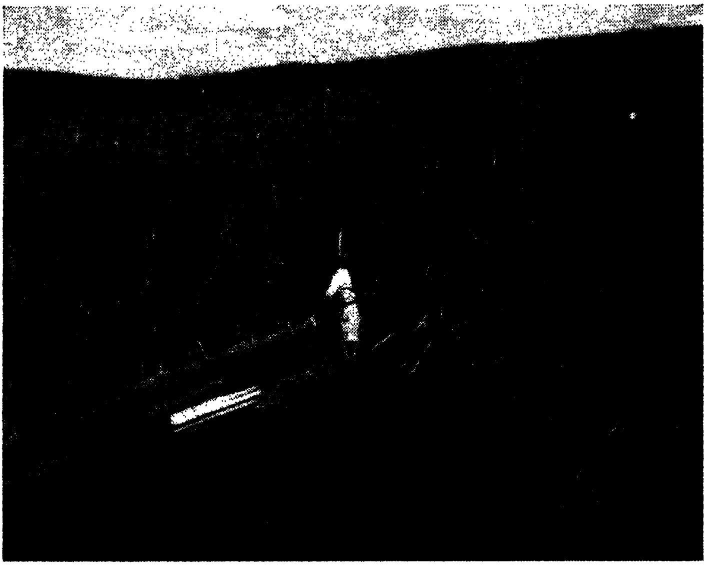


Plate 52.

PHOTOGRAPH IN WINTER, 1946, TAKEN FROM UPSTREAM SIDE OF DAM BUILT TO CAUSE SILTING OF GULLY AND CHECK SOIL LOSS IN A CHILDERS CANE FIELD.—Note that silting had already commenced.

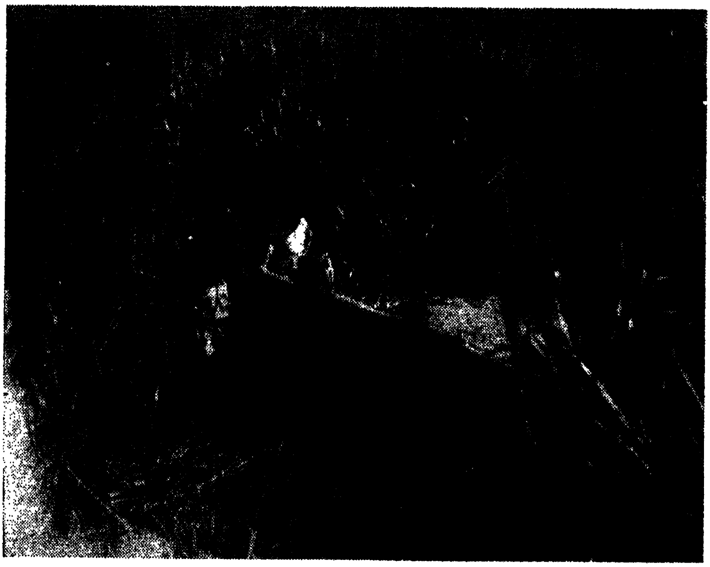


Plate 53.

PHOTOGRAPH OF DAM SHOWN IN PLATE 52, TAKEN FROM DOWNSTREAM SIDE.

Plate 54.

PHOTOGRAPH OF DAM AFTER HEAVY MID-FEBRUARY RAINS IN 1947, TAKEN FROM UPSTREAM SIDE, SHOWING DESTRUCTION OF DAM AND SCOURING OUT OF SILT, WHICH HAD ACCUMULATED PREVIOUSLY.

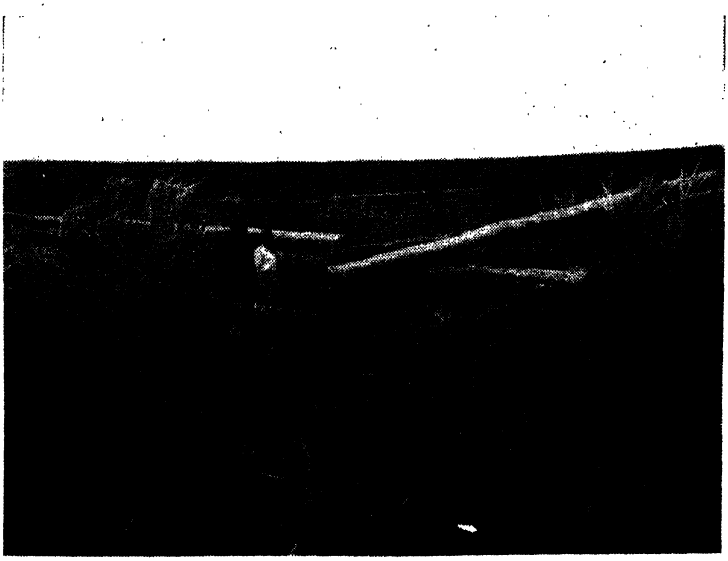


Plate 55.

PHOTOGRAPH OF DAM SHOWN IN PLATE 54, TAKEN FROM DOWNSTREAM SIDE.—The cane shown in Plates 52 and 53 subsequently died during the drought of 1946, and was not fit for harvest. The residues were ploughed in prior to the heavy rain.

early rain was good, but the loose soil later became saturated and commenced to move downwards when moving water appeared on the soil surface as the rain continued. Much soil was lost and many wide gutters were washed out in the cultivation in addition to the scouring and destruction of the dam. The former effect considerably hampered the subsequent preparation of a suitable seed bed for the autumn planting.

Plate 56.

EROSION ON A SLOPE OF A CHILDERS CANE FIELD.—In the foreground is a wide expanse of eroded soil deposited on a grass paddock. At the top of the hill, the land is being re-worked to fill in gutters in preparation for cane planting. Heavy rain in early March again severely eroded this area.

In terms of length of land use, Queensland cane-growing areas are still very young, and many present-day farmers are not yet fully cognisant of the dangers of soil erosion. A number of eroded soils have sufficient soil depth to permit repeated turning up of a fresh layer for cultivation and with the use of fertilizers it has been possible to continue profitable production on such land for some time, hence the tendency of many farmers to pay little heed to the menace of soil erosion. However, very few of the sloping areas can continue indefinitely with this process and ultimately land so treated will have to be abandoned for further cultivation.

Although none of the world's research stations has developed detailed methods of control for heavy rainfall areas such as the Queensland cane-growing districts, a survey of the Queensland cane belt reveals that commonsense methods could be applied in many instances to reduce soil losses. Too many farmers still plant and cultivate up and down the slopes. Fires are allowed to burn hillsides clear of vegetation and later excess water from these hillsides, unimpeded by a grass and weed cover, pours down swiftly over unprotected cultivations. Where possible grassed and graded diversion ditches should be formed to carry water away from cultivations, while any unnecessary burning of crop residues should be avoided.

The problem of arresting soil erosion and deterioration in Queensland canefields is a difficult one and is not made any easier by the system of monoculture characteristic of the industry, and the erratic rainfall of the cane-growing belt. A thorough examination needs to be made of the merits of contour farming, alone and supplemented by terracing. Strip cropping on certain types of soil and slope may also have to be considered as well as grassed waterways and diversion ditches. In some areas, farming methods in use at present may also require modification. It is clear that any system which permits the exposure of uncovered fallow fields during the period of potential heavy rainfall is basically unsound and only serves to accelerate the rate of erosion. All forms of soil erosion preventive measures must be accompanied by good farming practices to achieve a full measure of success.

It is important to realize that although contour farming may materially reduce soil losses, the loss of soil with some soil types on certain slopes, even after the adoption of erosion control practices, may still be too great to maintain sustained agriculture. On most soils this seems to be particularly true where the grade of slopes is greater than 10 per cent. In other words it is highly probable that crop production on steeply sloping land subject to soil erosion will finally dwindle to an uneconomic level and the land will then be abandoned. Fortunately, cane itself is a soil-binding plant and the cane rotation requires only one seed bed preparation every four years on the average, hence this retrogression will be gradual and in some cases comparatively slow.

Overseas experience with a variety of crops other than sugar cane, particularly in the United States of America, has shown that the benefits to be gained from lands farmed according to suitable erosion practices include increased crop yields, conservation of moisture and reduction of soil losses. Furthermore, cultivation on the contour is easier and more efficient than up and down the slopes. As well as these advantages, the decreased expenditure in repairing fields also helps to offset the cost of installing erosion prevention measures. The benefits from soil erosion control practices may not be apparent immediately, especially on fields in which serious deterioration has not already occurred or in badly eroded fields where benefits may not show until a certain amount of soil building has been brought about. However, the answer to the question of whether economic gains can be achieved in Queensland cane fields will depend upon the solution of the problem of modifying and adapting known soil erosion control practices to work satisfactorily under the conditions of cane growing in areas of heavy to very heavy rainfall.

GRAIN SORGHUM SEED FOR SALE.

The Department has on hand a supply of Hegari Sorghum seed which was received from America at the beginning of this year.

PRICE: The seed is being made available to farmers at the rate of 4d. per lb. freight paid to purchaser's nearest railway station.

Application for seed with accompanying remittance should be addressed to—

The Under Secretary,
Department of Agriculture and Stock,
BRISBANE.

PLANT PROTECTION

Lyctus (Powder Post) Beetles in Queensland Timbers.

By A. R. BRIMBLECOMBE, M.Sc., Entomologist.

THE increased demand for building material in Queensland has brought into prominence many additional timber species not formerly exploited because of their susceptibility to attacks by the powder post or Lyctus beetles.* For this reason, methods of immunizing such timbers against attacks by these borers have been closely studied in recent years. Considerable progress has been made, and one method of borer-proofing timber is now applied commercially in this State. However, much borer-susceptible timber is still being used for the construction of buildings and in the manufacture of furniture, tools and similar products, and it is therefore desirable that everyone involved in the handling and usage of timber should be acquainted with the powder post beetles and methods of preventing their damage.

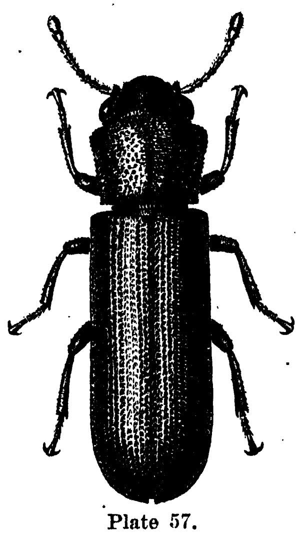
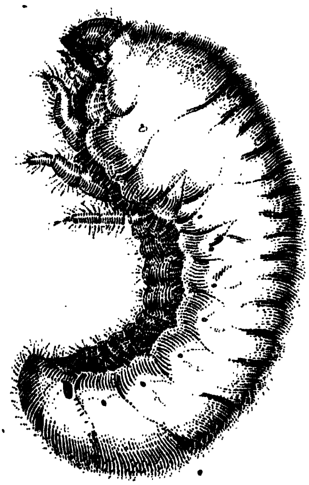


Plate 57.
POWDER POST BEETLE × 12.



[*Drawings by William Manley.*
Plate 58.
POWDER POST BEETLE.—Larva or grub × 12.

Life History.

There are two powder post beetles in Queensland, one of which occurs throughout the State while the other is confined to northern

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* *Lyctus brunneus* Steph. and *L. discedens* Blk.

Queensland. The habits of the two insects are similar, but the northern species is about half the size of the cosmopolitan and more common pest which is the principal one discussed in this article.

The powder post beetle is dark brown in colour, elongate in shape, and about one-fifth of an inch in length (Plate 57). During its life cycle it passes through four stages which are the egg, the larva or grub, the pupa and the adult beetle.

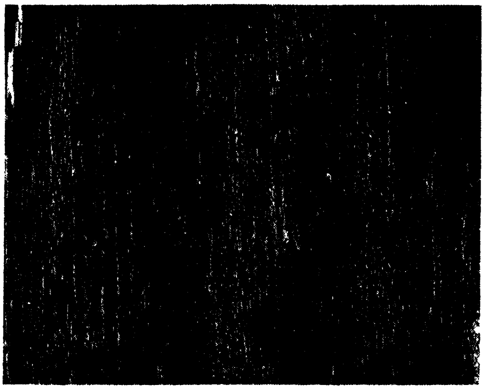

Plate 59.

POWDER POST BEETLE.—Infested timber showing emergence holes of the beetle.

The eggs are whitish in colour and cylindrical in shape, tapering into a thread at one end. They are laid into the pores of the wood, and under favourable conditions hatch in a period between one and two weeks. After emerging from the eggs, the grubs tunnel in the wood until they are full grown. At this stage they are slightly curved in shape, about one-quarter of an inch in length, and whitish in colour with a brownish head (Plate 58). The period required for their development varies according to the amount of suitable food available in the wood. Under some conditions this period might be as short as four months, while under less suitable conditions it might extend to ten months. However, in Queensland the grub-stage is usually completed in six to seven months. When the grub is full grown it normally approaches the surface of the wood and excavates a small oval cell where it sheds its skin and changes to the pupa. This resting stage covers about three weeks, during which internal changes occur in preparation for the final transformation to the adult beetle. After a few days the beetle chews its way to the surface. It is the emergence of beetles which causes the numerous small round holes on the surface of infested timber (Plate 59).

The powder post beetle may pass through two generations in a year. Beetles are most abundant during the spring and summer months but, due to overlapping of the generations, they can be found throughout the year. For this reason, infestation may begin at any time.

Habits of the Beetles.

The beetles emerge from the timber during the night, more particularly after dusk. They do not like light and when exposed in the daytime they crawl to shaded positions on the under sides of any

nearby objects, between boards, or into old emergence holes. Mating takes place soon after emergence, and during a life of several weeks the females lay eggs into the same or other timber. They can fly readily, and probably spread by this means.

Egglaying mainly occurs soon after dusk, although it can extend later into the night and sometimes may take place during the day in secluded positions. The ovipositor or egglaying tube is inserted into a pore in the wood, and thus the eggs are laid below the surface. Fifty eggs can be laid by each female. As many as eight eggs may be placed into one pore; however, the number usually varies from one to four. Pores opening on any surface are used whether it is longitudinal or transverse. Egglaying into cracks and crevices in the wood is extremely rare, but the eggs may be placed into pores on the cracked surfaces.

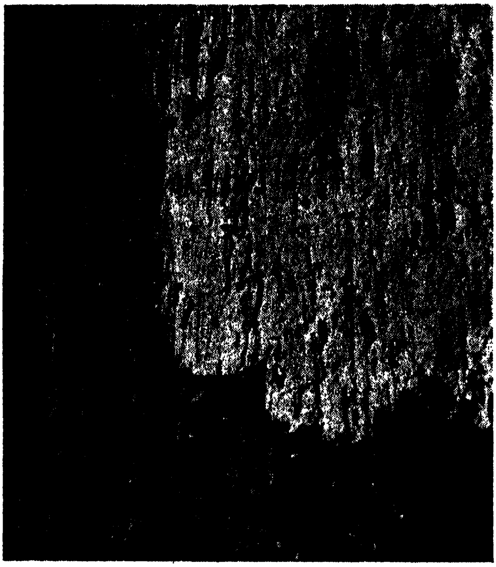

Plate 60.

POWDER POST BEETLE.—Infested timber with part of outer surface removed to show tunnels along the grain.

Habits of the Grubs.

Soon after hatching from the eggs, the grubs tunnel deeper into the wood. Tunnels are mostly along the grain (Plate 60), but their direction may vary according to the structural characteristics of the timber and the availability of food in the wood cells. Grubs of later generations tunnel wherever solid wood remains and thus the whole of the infested part is eventually reduced to powder (Plate 61). The fine debris in the tunnel is like flour and is packed behind the grub as it progresses through the wood. Sometimes, a tunnel may just break the surface of the wood or the wall of an adjacent tunnel leading to an emergence hole and the debris is then pushed to the exterior (Plate 62). The little heaps of powder which accumulate on the surface of infested wood or beneath it are often the first sign of Lyctus infestation.

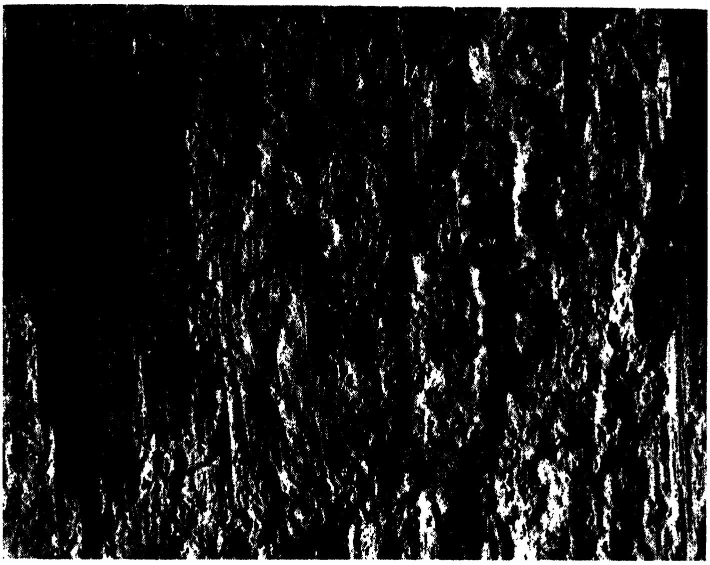

Plate 61.
POWDER POST BEETLE.—Infested timber with infested parts reduced to fine powder.

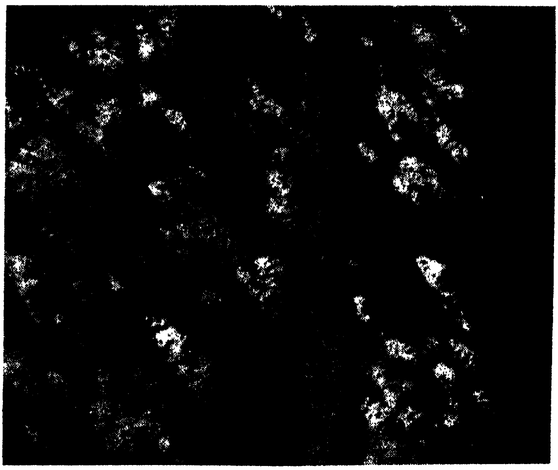

Plate 62.
POWDER POST BEETLE.—Infested timber showing borer dust on outside.

The Lyctus grubs have definite food preferences, chief among which is the starch located in the cells of the wood tissue. Eggs may be laid into wood containing little or no starch, but the young grubs die soon after hatching. As they tunnel, the grubs chew away the wood and although practically all of this is consumed, the starch is the main constituent extracted from it. When the starch content of the wood is high, numerous grubs may be working closely together and quickly become full grown; in timber with a low starch content, the grubs usually are less numerous and probably take much longer to reach maturity.

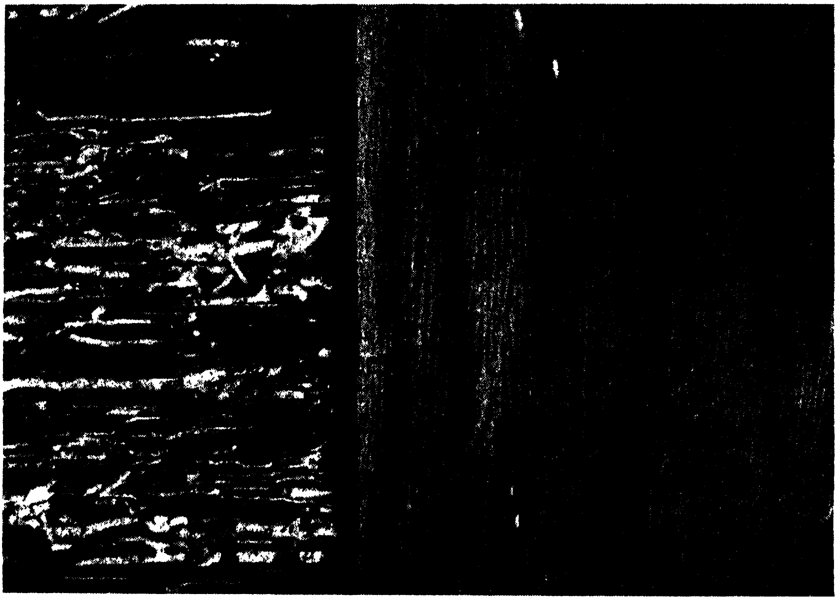

Plate 63.

POWDER POST BEETLE.—Emergence holes through pine veneer from infested core stock shown exposed on left.

Who Suffers from Lyctus Attacks?

Those who suffer most in Queensland from attacks by the powder post beetle are the owners of recently constructed homes. Loss may also be suffered by timber merchants, architects, builders, joiners, and other manufacturers or dealers, more particularly if stocks of timber or manufactured articles are held for some time.

Susceptible timber from Queensland scrubwoods may go straight from sawmills to homes or other buildings in course of erection. Within a year or two the owner may find borer dust coming from the timber or borer holes appearing in increasing numbers in various places (Plate 63), even through panelled or plaster walls. The treatment or replacement of damaged timber involves considerable trouble and expense.

What Makes Timber Susceptible to Lyctus?

The grub stage of the powder post beetle is responsible for the destruction of infested timber. The grubs tunnelling through the timber

subsist on starch stored in the wood as a food reserve for the growing tree. The amount of starch in the wood therefore is an important factor determining the risk of an attack and the severity of the damage.

Another important factor influencing Lyctus attacks is the size of the pores in the wood. The beetles do not lay their eggs indiscriminately but place them into pores in the wood. Provided the beetle can insert the ovipositor into a pore, eggs can be laid. For this reason, as a general rule, only those timbers with pores as large or larger than the size of the egglaying tube are attacked.

The two important factors influencing attacks therefore are starch content and pore size of the wood. If the starch content is negligible the wood is not attacked even though the pore size is favourable; conversely, if the pore size is too small no attack occurs even though the starch content may be high. Unfortunately, the majority of Queensland's timbers may contain abundant starch and possess comparatively large pores. Pine and other coniferous timbers do not possess pores and therefore are naturally immune to Lyctus attacks.

The northern powder post beetle is capable of attacking timbers with a pore size smaller than that required by the more common species. Consequently, the starch content of the wood is the predominantly important factor governing Lyctus attacks in northern Queensland.

Plate 64.

RED TULIP OAK.—Log section showing band of sapwood and intermediate wood which are liable to attack by powder post beetles.

The Location of Starch in Timber.

The wood tissue of trees may be composed of two or three of the following types:—sapwood, intermediate wood, and truewood. Most trees, e.g. spotted gum, contain sapwood and truewood only. In these the food reserves, chief among which is starch, are stored in the sapwood which therefore is the tissue attacked by the Lyctus beetles. Some of the scrubwood species, e.g., red tulip oak (Plate 64), possess an intermediate wood as well as sapwood, the former being intermediate in position

and function between the sapwood and truewood. This tissue as well as the sapwood may contain starch and therefore is also liable to Lyctus attacks. For practical purposes the sapwood and intermediate wood may be regarded as outer and inner sapwood respectively and referred to collectively as sapwood. Truewood does not contain starch and consequently is not attacked by this insect.

After a tree of a susceptible species is felled and the cells in the wood tissue die, the starch content of the sapwood remains unchanged. Even when the log is sawn and the timber is air- or kiln-dried the starch is practically unaltered and the timber is still susceptible to attack.

The various species of trees may store starch in the sapwood in different amounts. Species which are heavily attacked by Lyctus can store abundant starch, and the amount may vary with the season.

Timbers Attacked.

As previously mentioned, the main condition favouring Lyctus attacks is the presence of sufficient starch in a wood with suitably sized pores. Many Queensland timbers meet this requirement and are therefore liable to attacks. However, some timbers, e.g., grey ironbark, normally do not possess sufficient starch, while in others, e.g., sassafras, the pores are too small. There are still others in which attacks do not occur although the starch content and pore size are suitable. The susceptible species are well known and these are listed in an appendix. It will be noted that no pine or other coniferous timbers are listed; all are immune to Lyctus attacks.

When is the Attack Started?

Lyctus beetles occur in practically every place where timber is being handled, more particularly in the forest, the mill yards, timber storage yards, factory premises, recently constructed buildings, or those in course of construction. Attacks can begin in any of these places, but they commonly commence on logs. They might not occur on green sapwood of freshly felled logs, but it is only a matter of a few days before exposed wood is suitable for egglaying. Consequently, timber cut from logs of susceptible species must be regarded with suspicion even though the logs may be milled soon after they are felled.

Because attacks can commence at practically any time and place under Queensland conditions, no one handling or using untreated timber can justly blame another person for any damage which might occur. However, it would be an advantage to all connected with the timber industry if timber was rendered immune to borer attacks at some stage before it is used in buildings, furniture or other manufactured products.

How to Determine What Timber should be Borer-proofed.

It need not be taken for granted that every piece of sapwood timber from Lyctus-susceptible species is threatened with borer attacks. Sometimes, due to climatic or other factors, the starch content of the tree is low when the tree is felled and may decline to the Lyctus-immunity level while the log is still green. Such occurrences are irregular, and therefore reliance cannot be placed on them, but advantage may be taken of them when they do occur. For this reason it might not be

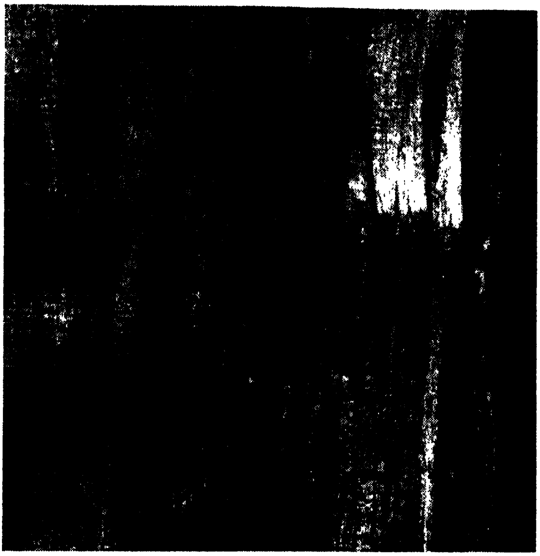

Plate 65.

CUT SURFACE OF LYCTUS-SUSCEPTIBLE TIMBER.—Above "a—a" iodine solution has not been applied; below "a—a," the wood is treated with iodine. Left of "b—b" is truewood; right of "b—b" is sapwood.

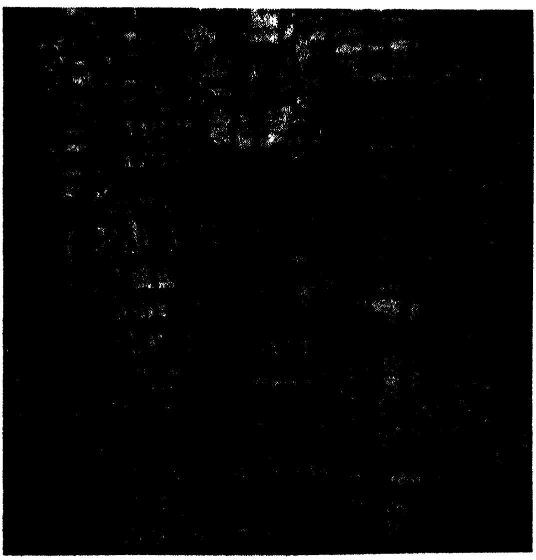

Plate 66.

PORTIONS OF IODINE-TREATED SAPWOOD.—Enlarged to show the coloured starch.

necessary to borer-proof the sapwood of all logs of susceptible species, and a convenient test is available to determine what timber should be borer-proofed. It consists essentially of checking the starch content of the wood.

In many hardwoods, e.g., spotted gum, and in some scrubwoods the sapwood is readily distinguished from the truewood by its lighter colour. In a number of scrubwoods, e.g., white cheesewood, however, the light colour of the truewood makes it extremely difficult to demarcate the sapwood, more especially after the timber is sawn and seasoned. It is particularly in species such as these that the test for starch is essential. In fact, it is desirable that all susceptible species be tested for starch so as to take advantage of the fact that when little or no starch is present in the timber, borer-proofing treatment can be omitted.

Starch readily turns a blue-black colour when treated with a solution of iodine. For testing wood for starch, iodine solution is made by adding ¼ oz. of iodine crystals and ½ oz. of potassium iodide to 1 quart of water and vigorously shaking until both the chemicals are dissolved. The iodine solution corrodes metals and therefore should be kept in a glass container.

The starch test can be made on a clean, freshly cut surface of the log or the sawn timber. This should be done on a split, rather than on a sawn, surface and should include the whole depth of the sapwood. The bulk of the starch occurs in the medullary rays of the wood, and for this reason the cut must be made on the quarter or, in other words, on the radius of the log (Plates 65 and 66). The iodine solution is applied by a small atomizer or by a brush, and in a few minutes the starch shows up mostly as blue-black dotted lines. If no starch is present only the yellow colour of the iodine solution is shown. In this way it can be determined whether any timber from a log need be treated and if so how much or in the case of sawn timber what boards should be treated. At least two tests should be made on the end of a log, on opposite sides, preferably on both ends, and the extent of starch-bearing wood marked with a chalk, due allowance being made for bends or bows in the log. Tests on boards may be made on each end or two other suitable places.

When and Where should Timber be Borer-proofed?

In view of the fact that suitable methods of borer-proofing timber have now been worked out, Lyctus attacks should be prevented, as the eradication of the borers from infested timber is a costly operation. The damage occurs mostly after timber has been constructed into buildings or manufactured into furniture or other articles. The application of any borer-proofing treatment should therefore be made at some time prior to construction or manufacture. Treatment would be most conveniently and economically applied where timber is handled in bulk, e.g., at the mills. Therefore, there is an obligation on millers to undertake mass treatment of all susceptible timbers. In Queensland, borer-proofing plants are in operation at most plymills, while several plants at sawmills are already in operation and others will be constructed in the near future.

Methods of Borer-proofing Timber.

Boric Acid Bath Treatment.

Boric acid is the most suitable chemical for borer-proofing timber, for it does not involve any harmful effects to operators of treatment plants or users of treated timber.

Plants for treating veneers are located at most plymills in Queensland and have been in operation for many years. They consist of suitably sized copper-lined vats provided at the bottom with heating coils. Sufficient boric acid is added to water in the vat to give a 1·25 per cent. solution, and the whole is heated to about 205 deg. F. The ply sheets are stacked in cradles which are hoisted and then lowered into the vats by means of an overhead gantry. Thirty minutes soaking is sufficient time for the boric acid solution to completely penetrate the veneers and the treatment leaves about 0·2 per cent. by weight of the chemical in the wood, which is sufficient to prevent Lyctus infestation.

Plate 67.

SPOTTED GUM.—Showing the high ring which promotes starch depletion in the bole.

A more recent development is the boric acid treatment of sawn timber. Modern sawmills have kiln-drying plants and boric acid treatment vats can be made of sufficient size to accommodate a kiln-size stack of timber. These vats may be constructed in various ways, a common type being of reinforced concrete and lined with copper sheets, provided with heating coils and a moveable bulkhead to enable the stack

of timber to be placed in position. The most modern plant in Queensland operates two adjoining vats, which conserve solution and heat and save time. Generally, the strength of the boric acid solution for treating sawn timber should not be less than 2·0 per cent. Again the solution is heated to about 205 deg. F., but the timber should be held at this temperature for a period of from two to four hours, depending on the species and the thickness of the boards, and then for a further period until the temperature drops to about 150 deg. F. This cooling process draws the solution into the pores so that the required amount of boric acid is taken into the wood. Timber treated in this way is permanently immune to attacks by the powder post beetle. Treatment is at present limited to timber two inches or less in thickness, thicker timber being a more difficult problem. Detailed information on vat design and treatment schedules can be obtained from the Forestry Department.

Starch Depletion.

The boric acid treatment of sawn timber is regarded as the standard method of borer-proofing the sapwood of Lyctus-susceptible timbers. The same result can be obtained, however, in many cases by ringbarking the trees at the top of the commercial length of bole. This causes the starch in the sapwood to be used up before the trees are felled. Such a treatment has been successfully used on the eucalypts, spotted gum, lemon-scented gum and brown bloodwood, and possibly it would also be successful on other eucalypt or open-forest species (Plate 67). Adequate starch depletion has been obtained from high-ringing on a number of rain-forest timbers; but other problems, such as the marked variation in the rate of starch depletion from tree to tree, might make the treatment of these species impracticable. However, in the open forests where these problems do not arise, the treatment is recommended. With the three eucalypts mentioned, the sapwood of the treated trees becomes immune to Lyctus attacks between six to eight months after high-ringing and no further treatment after felling is required.

Methods of Temporary Protection.

Logs of susceptible species may be temporarily protected from attacks by the powder post beetle. Such protection is most desirable when mills build up reserves of logs to tide them over periods of wet weather. The logs should be removed from the forest to a central dump as soon after felling as practicable. Lyctus attacks can occur only on exposed sapwood surfaces, so as much bark as possible should remain intact. At the central dump, any injured bark should be cut away until the remainder is fresh and firm on the log. The log ends and all other exposed wood surfaces should then be sprayed with K55 creosote, equal parts of creosote and kerosene, or hot creosote emulsion (one part of K55 creosote with one or two parts of 5·0 per cent. hot soft soap solution). Finally, all the exposed wood surfaces should be sealed with crude petroleum jelly or some other suitable sealing material. The logs should then be stacked in tiers to reduce the rate of drying. This treatment has proved effective on logs stored for periods up to almost two years.

Temporary protection can also be given to sawn timber by dipping, spraying, or brushing it with one or other of the solutions mentioned above, but the trouble involved is worth while only in small scale operations.

Methods of Arresting Attacks.

Because of the small number of boric acid treatment plants as yet in operation in Queensland, Lyctus-susceptible timber is still being used in large quantities for the construction of buildings and furniture. Borer attacks frequently occur in such timber if it has been held in stock for some time or after it is used for constructional or manufacturing purposes. There is therefore still a need for methods of arresting attacks when they do occur. Often the pest cannot be eradicated from infested timber without considerable trouble and expense, and purchase of non-susceptible or borer-proofed timber in the first place is the only real solution to the problem.

The most satisfactory method of treating infested sawn timber or manufactured articles is sterilization by heat in a seasoning kiln. The temperature of the kiln should be at least 130 deg. F. and the humidity not lower than 80 per cent. After allowing a sufficient time for this temperature to reach the centre of the wood (the period depending on the thickness), the timber should be held in the kiln for two hours. Heat treatment is sterilization only; it does not confer immunity from further attacks.

The most difficult problem is to arrest infestations occurring in the timber of buildings already constructed. Frequently they are in hidden places, while sometimes the choice of chemical to be used is rather limited. Timbers with a large cross-section, such as bearers, cannot as yet be borer-proofed by the boric acid treatment. However, existing standards limit the amount of sapwood on these, and even if Lyctus attacks occur the stability of the building is not affected. If the infestation in the smaller sizes of timber is heavy, replacement should be undertaken where possible; otherwise, the wood can be thoroughly brushed or sprayed with K55 creosote. Often the attacks occur in places such as in painted or polished walls, or in furniture, where the use of creosote is undesirable. In such cases paradichlorobenzene dissolved in kerosene (1 lb. to 1 gallon) or equal parts of turpentine and kerosene may be injected into the borer holes on the surface, any surplus liquid being wiped away. This treatment is localized to the holes already showing and cannot be expected to be completely effective with one treatment. In fact, the eradication of this borer from infested timber or furniture by spraying, brushing or localized injections frequently necessitates a number of treatments which are applied when fresh borer dust is observed or new holes appear.

Appendix.

QUEENSLAND COMMERCIAL TIMBER SPECIES SUSCEPTIBLE TO LYCTUS ATTACKS.

(Standard names in CAPITAL letters.)

Trade Reference Name.	Common Name.
ACACIA BAKERI	White marblewood
ACACIA HARPOPHYLLA	BRIGALOW
AILANTHUS IMBERBIFLORA ..	WHITE SIRUS
ALBIZZIA TOONA	RED SIRUS
ALBIZZIA XANTHOXYLON ..	YELLOW SIRUS
ALEURITES MOLUCCANA	CANDLENUT
ALSTONIA SCHOLARIS	WHITE CHEESEWOOD
Amoora nitidula	Incense wood
ANGOPHORA INTERMEDIA	ROUGH-BARKED APPLE

Appendix—*continued.*

QUEENSLAND COMMERCIAL TIMBER SPECIES SUSCEPTIBLE TO LYCTUS ATTACKS—*continued.*

(Standard names in CAPITAL letters.)

Trade Reference Name.	Common Name.
ANGOPHORA LANCEOLATA	SMOOTH-BARKED APPLE
ANGOPHORA SUBVELUTINA	Broad-leafed apple
APHANANTHE PHILIPPINENSIS	GREY HANDLEWOOD
Aryteria distylis	Silver cornelwood
BALOGHIA LUCIDA	IVORY BIRCH
BANKSIA INTEGRIFOLIA	WHITE BANKSIA
BEILSCHMIEDIA BANCROFTII	YELLOW WALNUT
BEILSCHMIEDIA OBTUSIFOLIA	BLUSH WALNUT
BLEPHAROCARYA INVOLUCRIGERA	ROSE BUTTERNUT
BURSERA AUSTRALASICA	BROWN CUDGERIE
CARDWELLIA SUBLIMUS	NORTHERN SILKY OAK
CASTANOSPERMUM AUSTRALE	BLACK BEAN
CEDRELA TOONA	RED CEDAR
Celtis paniculata	Silky Celtis
CINNAMOMUM LAUBATII	PEPPERWOOD
CINNAMOMUM OLIVERI	CAMPHORWOOD
CRYPTOCARYA ERYTHROXYLON	ROSE MAPLE
CRPYTOCARYA OBLATA	BOLLY SILKWOOD
CRYPTOCARYA OBOVATA	WHITE WALNUT
DIOSPYROS PENTAMERA	GREY PERSIMMON
DIPLOGLOTTIS CUNNINGHAMII	TAMARIND
Dysoxylum cerebriforme	Northern red bean
DYSOXLYUM FRASERANUM	ROSE MAHOGANY
DYSOXYLUM MUELLERI	MIVA MAHOGANY
DYSOXLYUM PETTIGREWIANUM	SPUR MAHOGANY
Dysoxylum rufum	Stinkwood
EHRETIA ACUMINATA	SILKY ASH
ELAEOCARPUS GRANDIS	SILVER QUANDONG
EMBOTHRIUM WICKHAMI	SATIN OAK
ENDIANDRA COMPRESSA	QUEENSLAND GREENHEART
ENDIANDRA DISCOLOR	ROSE WALNUT
ENDIANDRA PALMERSTONI	QUEENSLAND WALNUT
ENDIANDRA SIEBERI	PINK WALNUT
ENDIANDRA VIRENS	N.S.W. WALNUT
ERYTHRINA VESPERTILIO	GREY CORKWOOD
ERYTHROPHLOEUM LABOUCHERII	Cooktown ironwood
EUCALYPTUS ANDREWSI	NEW ENGLAND ASH
EUCALYPTUS CORYMBOSA	RED BLOODWOOD
EUCALYPTUS MACULATA	SPOTTED GUM
EUCALYPTUS MICROCORYS	TALLOWWOOD
EUCALYPTUS PUNCTATA	GREY GUM
EUCALYPTUS RESINIFERA	RED MAHOGANY
EUCALYPTUS ROBUSTA	SWAMP MAHOGANY
EUCALYPTUS SALIGNA	SYDNEY BLUE GUM
EUCALYPTUS TESSELLARIS	CARBEEN
EUCALYPTUS TRACHYPHLOIA	BROWN BLOODWOOD
Eugenia brachyandra	Red apple
Eugenia cormiflora	Onionwood
Eugenia corynantha	Sour cherry
EUGENIA GUSTAVIOIDES	GREY SATINASH
EUGENIA HEMILAMPRA	White eungella gum
Eugenia myrtifolia	Creek cherry
EUROSCHINUS FALCATUS	PINK POPLAR
Excaecaria dallachyana	Scrub poison tree
Ficus cunninghami	Small-leaf fig
Ficus glomerata	Cluster fig
Ficus macrophylla	Moreton Bay fig
Ficus stephanocarpa	Sandpaper fig

Appendix—*continued.*

QUEENSLAND COMMERCIAL TIMBER SPECIES SUSCEPTIBLE TO LYCTUS ATTACKS—*continued.*

(Standard names in CAPITAL letters.)

Trade Reference Name.	Common Name.
FLINDERSIA ACUMINATA	SILVER SILKWOOD
FLINDERSIA AUSTRALIS	CROW'S ASH
FLINDERSIA BENNETTIANA ..	BENNETT'S ASH
FLINDERSIA BOURJOTIANA ..	QUEENSLAND SILVER ASH
FLINDERSIA COLLINA	Leopard ash
FLINDERSIA IFFLAIANA	HICKORY ASH
FLINDERSIA OXLEYANA	YELLOWWOOD
FLINDERSIA PUBESCENS	NORTHERN SILVER ASH
FLINDERSIA SCHOTTIANA	SOUTHERN SILVER ASH
GEIJERA SALICIFOLIA	Green satinheart
GEISSOIS LACHNOCARPA	MARARIE
GREVILLEA ROBUSTA	SOUTHERN SILKY OAK
Helicia ferruginea	A silky oak
Hemicyclia australasica	Grey boxwood
Jagera pseudorhus	Foambark
Litsea dealbata	A bollygum
LITSEA RETICULATA	BOLLYWOOD
LUCUMA GALACTOXYLON	RED SILKWOOD
MALLOTIS PHILIPPINENSIS ..	Kamela
MELIA DUBIA	WHITE CEDAR
PANAX ELEGANS	SILVER BASSWOOD
PLEIOGYNIUM SOLANDRI	TULIP PLUM
PITTOSPORUM RHOMBIFOLIUM ..	WHITE HOLLY
PSEUDOMORUS BRUNONIANA ..	WHITE HANDLEWOOD
RHODOSPHAERA RHODANTHEMA	TULIP SATIN WOOD
SARCOCEPHALUS CORDATUS ..	CHEESEWOOD
SCHIZOMERIA OVATA	WHITE BIRCH
SIDEROXYLON AUSTRALE	BLACK APPLE
SIDEROXYLON POHLMANNIANUM	YELLOW BOXWOOD
SIDEROXYLON RICHARDI	BLUSH COONDOO
SIPHONODON AUSTRALE	IVORYWOOD
SLOANEA AUSTRALIS	BLUSH ALDER
Sloanea langii	Northern blush alder
SLOANEA WOOLLSII	YELLOW CARABEEN
STENOCARPUS SALIGNUS	RED SILKY OAK
STENOCARPUS SINUATUS	WHITE OAK
STERCULIA ACERIFOLIA	Flame kurrajong
Sterculia discolor	White kurrajong
STERCULIA DIVERSIFOLIA ..	KURRAJONG
Synoum glandulosum	Red sycamore
TARRIETIA ACTINOPHYLLA ..	BLUSH TULIP OAK
TARRIETIA ARGYRODENDRON ..	BROWN TULIP OAK
TARRIETIA PERALATA	RED TULIP OAK
Terminalia sericocarpa	Sovereignwood
Xanthophyllum macintyrei	False saffronheart

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Larger Horned Citrus Bug Control with D.D.T.

A. W. S. MAY, Assistant Entomologist.

THE larger-horned citrus bug* is a common pest in a number of important citrus districts in Queensland. Although losses from this pest may be experienced in certain coastal orchards in dry years, the bug is normally restricted to sub-coastal and inland areas where damage is a yearly phenomenon. Of the cultivated citrus varieties, lemons are most subject to attack, although mandarins are frequently infested. In uncontrolled infestations, all varieties may be attacked.

Fumigation and hand-picking are recognized methods of control, but the timing of fumigation in the pest and disease control programme is dictated by the well-defined migration periods of the bug, by the scale insect position and the presence or otherwise of spray residues on the foliage and fruits. In addition, suitable weather conditions are required for its application. Recently, extensive laboratory and field experiments with D.D.T. have shown that this insecticide is very effective against the larger horned citrus bug. The exacting and laborious technique necessary to control this pest by fumigation is thus obviated and orchardists now have an alternative, efficient and easily applied control measure at their disposal.

Advantages of D.D.T.

The egg stage of the bug is resistant to fumigation which must therefore be applied after migration ceases but before egg laying takes place. Rarely is such exact timing possible, and invariably a second fumigation is necessary to kill nymphs arising from eggs that survived the initial treatment. The use of D.D.T. overcomes this difficulty, for although eggs present at the time of spraying will continue to develop and hatch normally, the newly emerged nymphs are killed once they walk over the spray residue on the tree. This residual effect of D.D.T. lasts up to fourteen days in the case of 0·2 per cent. sprays. When the spray is used at this concentration, all nymphal stages and adults that are wetted when the spray is applied die. In addition those individuals that escape the initial treatment are killed when they come in contact with sprayed surfaces on the tree. Further, migrating adults arriving in the orchard and settling on sprayed trees within two weeks of the spray application fail to survive.

The efficiency of D.D.T. enables it to be used on a less exacting schedule than fumigation. Consequently, the spray may be applied by the orchardist whenever the bugs are present on the trees in troublesome numbers.

Orchard Recommendations.

The orchardist has many proprietary brands of D.D.T. at his disposal. However, these contain D.D.T. in various amounts and, after selecting a product suitable for use on plants, the grower must follow

* *Biprorulus bibax* Bredd.

closely the manufacturer's directions when mixing the spray. The percentage of D.D.T. in the spray will depend to a certain extent on the degree of bug infestation, the variety of citrus to be treated and its liability to reinfestation, and the possibility that migration into the orchard may continue after the spray is applied.

A spray containing 0·2 per cent. D.D.T. has, as stated above, a definite residual effect and is recommended for bug control in lemons and those varieties of mandarins that are subject to reinfestation. Although a D.D.T. spray is less costly than fumigation for bug control, the economical use of materials is a necessary consideration. At the 0·2 per cent. level, only sufficient spray need be applied to wet the greater part of the foliage and twigs. This would require about one gallon of spray for each tree in full bearing if a fine nozzle giving a mist spray is used. The residual effect of such a spray will compensate for the incomplete coverage.

In the case of an 0·1 per cent. D.D.T. spray, double the quantity of spray would have to be applied to give a D.D.T. load per tree comparable with the 0·2 per cent. spray, but in this instance the spray run-off may be high and the residual effect may be less than that required. However, where only a contact spray is needed and residual effects are unimportant, a concentration of 0·1 per cent. may prove satisfactory.

Spray applications will probably be needed in each of the three well-defined bug migration periods in spring, early summer, and mid-summer. The actual time of spray application will depend largely on the bug position in the orchard, although consideration should also be given to the combination of D.D.T. with other sprays used in routine pest and disease control measures.

Apart from showing no interaction with existing spray residues on the trees when the spray is applied, D.D.T. can be combined with certain other spray materials. Since complete coverage is essential with white oil and copper sprays, relatively large amounts of spray are used per tree, hence the advisability of adding D.D.T. to either must be considered on a cost basis. It will probably be more economical to apply D.D.T. by itself as a partial cover spray than to prepare a combination spray containing D.D.T. and white oil or D.D.T. and a copper fungicide.

D.D.T. and Maori Mite.

Experimental evidence has been obtained that mites are not controlled by the concentrations of D.D.T. used on citrus, and Maori mite populations may increase considerably following applications of this spray in summer. Fumigation has a controlling influence on mite populations and if it is omitted from the scale control programme an additional spray for the control of Maori mite will be needed. An early summer lime-sulphur spray, at 1 : 35 strength, for Maori mite control should be an essential part of any orchard spraying programme. An additional treatment for mite control, preferably wettable sulphur if temperatures at the time are too high for the safe use of lime-sulphur, is recommended during mid- or late summer. This spray would either follow the D.D.T. spray applied in midsummer for bug control or be used with it in a combined spray if the available D.D.T. can be safely added to wettable sulphur or lime-sulphur.

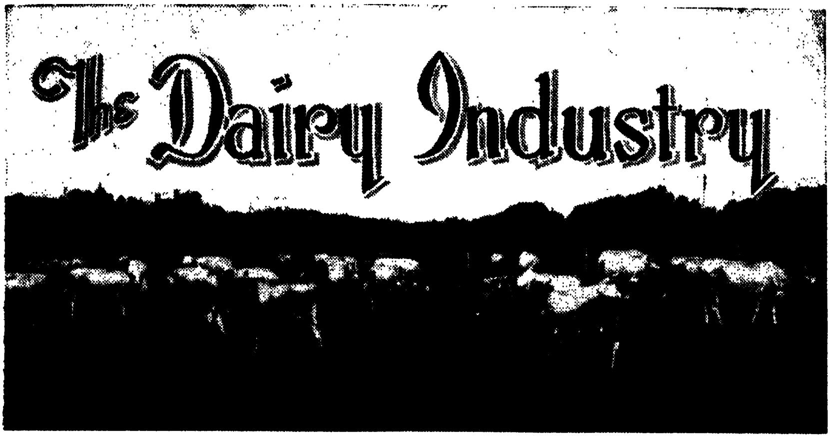
FIELD OFFICERS' REFRESHER COURSE, 1947.

Plate 68.

Front Row (Left to Right)—Messrs. D. O. Atherton, Assistant Director of Agriculture; C. J. McKeon, Director of Agriculture; W. T. Gettons, Assistant Under Secretary, Adm.; A. F. Bell, Under Secretary; Hon. H. H. Collins, Minister for Agriculture and Stock; R. Veitch, Assistant Under Secretary, Tech.; Dr. W. A. T. Summerville, Director, Plant Industry; W. G. Wells, Director, Regional Experiment Stations; C. S. Clydesdale, Senior Adviser in Agriculture; and J. A. Kerr, Senior Adviser in Agriculture.

Centre Row (Left to Right)—Messrs. G. Rasmussen, J. A. Mobbs, S. E. Stephens, L. G. Trim, K. G. Fisher-Webster, A. J. Crocker, W. G. Ferguson, R. W. George, N. E. Goodchild, and K. V. Henderson.

Back Row (Left to Right)—Messrs. F. A. L. Jardine, K. D' R. Hoffman, J. McG. Wills, E. F. Tree, T. Graham, E. J. McDonald.



The Cleansing of Milking Machines.

THE DILUTE CAUSTIC SODA SOLUTION METHOD.

DIVISION OF DAIRYING.

THE successful operation of a milking machine depends on the care and time given to it. Any neglect in keeping it clean will be reflected in the quality of the milk or cream supplied to the factory. The boiling water and caustic soda method has proved efficient for the cleansing of the milking machine, and in order that the method may be simply yet thoroughly applied the following are essentials:—

(1) An adequate supply of pure water.

(2) A steam sterilizer for boiling water and providing steam.

(3) Caustic soda. (Approved proprietary cleansers may be used in place of caustic soda.)

(4) A complete set of brushes for cleaning all parts of the machine.

To simplify this method, a routine system should be adopted, and the following has been found satisfactory in actual practice:—

Treatment Before Use.

Just before milking, give the machine (and all utensils) a cold water rinse to which a chlorine compound (used in accordance with instructions on the label) has been added (chlorine is not a cleanser, but a germicide). The used chlorine solution may be retained for washing udders, also floors and for similar purposes.

Treatment After Use.

Milk System.

1. Immediately after each milking wash all dirt from the exterior of the rubbers and teat cups, using a vessel and brush kept exclusively for this purpose.

2. Draw 1 gallon of cold water through each set of teat cups; while doing this, withdraw the cups from the water several times, thereby

causing a surging effect which flushes the pipes and rubbers more thoroughly, and facilitating more effective removal of milk residues than a steady flow. Always start on the set of teat cups farthest away from, and work towards, the releaser.

3. Draw through each set of teat cups at least 1 gallon of hot dilute caustic soda solution, which is made by dissolving 1 level dessertspoonful of caustic soda in 4 gallons of hot water. (Proprietary cleansers may be used instead of caustic soda, and, if so, use them according to the instructions on the label of the package.) While drawing the hot caustic soda solution through the teat cups nearest the releaser, the torpedo brush supplied with the machine, a ball of horsehair or a piece of cloth of unfraying quality is run through the milk pipe. The vacuum will carry this through with sufficient momentum to remove traces of milk from the interior of the pipe. If a torpedo brush is used the attached cord should be just long enough to enable the brush to travel the full length of the milk line, but not so long as to allow it to hit against and damage the metal of the releaser. Retain the caustic soda solution for using on the air line.

4. Next flush the whole of the milk system with clean, *boiling* water, using at least one gallon (preferably two) per unit, in order to remove all traces of the soda solution. This is important, for if the caustic soda solution is not rinsed off with plain water the tinning will gradually be removed from the milk pipes.

5. After this has been done, sterilize the entire milk system with steam, but it should always be remembered that the efficiency of steam sterilization depends on the effectiveness of the prior cleansing operations. If steam is applied to the machine before thorough cleansing, the heat will bake the milk remnants on to the interior of the pipes. This residue forms a hard deposit, known as milkstone, which makes cleansing and near sterilization difficult.

Air System.

Cleanse the air line at least once daily by flushing with hot soda solution, followed by clean, hot water. (The soda solution and hot water previously used for the milk lines may be used.) Because of the differences in the way of cleaning the airline of different machines, the manufacturer's instructions should be carefully followed. In the event of a farmer not knowing how to clean the airline of his machine, he is advised to contact the manufacturer or the local Dairy Officer.

N.B.—It is important to thoroughly cleanse at each milking the rubber connection from the bottom chamber of the releaser attached to the pulsation system.

Sundries.

After all operations have been completed, dismantle the releaser, thoroughly cleanse, and sterilize with steam. Then remove the vacuum tank, cleanse, sterilize, and store both it and the releaser in some dust-free position.

Take the teat cup assembly and long rubbers off the down drops, and hang in a cool place. Remove all rubber plugs, or throw open flaps.

After each milking, remove the glass observation bowls and rubber washers under them and place in a position to dry.

Weekly Dismantling of Machine.

At least once a week completely dismantle and clean the machine. Take down the observation bowls, rubber washers, teat cups, claws, air and milk droppers and top rubbers; in fact, every part of the plant that will come asunder, and throughly wash inside and out with hot soda solution, then boiling water, and finally sterilize with steam.

At least once a week place all rubberware in a bag, suspend in water to which has been added one level tablespoonful of caustic soda to 4 gallons of water, and boil for ten minutes. This prolongs the life of rubberware.

Summary.

Summarised, the procedure in the cleaning of machines by the dilute caustic soda solution method is:

(1) Just before each milking flush the milk system with clean, cold water containing a chlorine compound in the proportion indicated by the manufacturer.

(2) After use, rinse each unit with at least 1 gallon of cold water.

(3) Run through the milk system a hot, dilute caustic soda solution (1 level dessertspoonful of caustic soda to 4 gallons of hot water), using 1 gallon of the solution to each set of teat cups.

(4) Run plain *boiling* water through each set of teat cups, using at least 1 gallon (preferably 2) of boiling water for each unit.

(5) Sterilize the milk system with steam.

(6) Once daily thoroughly cleanse the air lines.

(7) Remove and dismantle the releaser and vacuum tank, wash each thoroughly, sterilize with steam and store in a dust-free place.

(8) Disconnect teat cups and all rubbers. Open up all flaps or remove rubber plugs on the machine.

(9) At least once a week completely dismantle the machine and thoroughly cleanse and sterilize it.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S., Jersey and Guernsey Societies' Herd Books, production records for which have been compiled during the month of July, 1947. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 4 YEARS (STANDARD 310 LB.)				
Yarranvale Annabelle	W. Henschell, Yarranlea	8,933·2	360·593	Trevor Hill Vosca
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Mountain Home Gem 56th	M. C. Lester, Glengallon	10,558.7	389.769	Fairvale Ensign
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Jamberoo Buttercup 6th	A. F. Ezzy, Milmerran	6,932·5	269·614	Murray's Bridge Florrie's Prince
JERSEY.				
MATURE COW (STANDARD 350 LB.)				
Gem May	W. Bishop, Kenmore	11,557·4	692·354	Ardroy Lace's Volunteer
Gem Lula	W. Bishop, Kenmore	8,030·00	434·007	Bulby Oxford Gamboge
Balwyn Ginger Lass	R. J. Browne, Yangan	7,295·5	415·498	Oxford Darby
JUNIOR, 4 YEARS (STANDARD 310 LB.)				
Gem Mab	W. Bishop, Kenmore	7,646·6	417·632	Bulby Oxford Gamboge
Navua Elfa Victorine	C. A. Edwards, Alderley	7,614·99	366·246	Navua Victoire's Ruler
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Trecarne Jersey Hope 2nd	J. J. Ahern, Conondale	7,164·75	414·694	Trecarne Some Suke
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Carnation Hope's Hazel	W. Spresser and Sons, Ipswich	7,030·5	350·643	Trecarne Victor 2nd
Pinegrove Betty	J. W. Evans, Rosewood	5,703·85	317·287	Glenview Victor
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Trinity Cute Daffodil 2nd	J. S. McCarthy, Greenmount	6,486·5	310·079	Samares Cute Prince 3rd

JUNIOR. 2 YEARS (STANDARD 230 LB.)

Nairfale Lena	R. J. Browne, Yangan	7,055·4	356·619	Nairfale Golden Reality
Gem Ingrid	W. Bishop, Kenmore	6,617·45	348·785	Bulby Oxford Gamboge
Brookland Merry Prudence	W. S. Conochie, Sherwood	6,707·95	345·969	Bulby Maria's Keepsake
Gem Isobel	W. Bishop, Kenmore	5,806·45	341·88	Gem Valour
Nairfale Trinket	R. J. Browne, Yangan	6.231·2	332·287	Nairfale Count Prominence
Brook Lodge Amethyst	J. J. Ahern, Conondale	6,364·25	313·968	Trinity Mighty Prince
Trinity Hopeful Treasure	J. J. Ahern, Conondale	5,870·1	283·988	Trinity Crowning Effort
Brooklodge Sweet	J. J. Ahern, Conondale	5.234·95	270·642	Trinity Mighty Prince
Carnation Hope's Hazelette	W. Spresser and Sons, Ipswich	5.297·65	267·997	Bellgarth Glory King 2nd
Romsey Prim Pixie	J. Wilton, Killarney	4,814·7	261·135	Oxford Pixie's Victor
Carnation Model 2nd	W. Spresser and Sons, Ipswich	5.233·7	260·197	Bellgarth Glory King 2nd
Pinegrove Sunshine	J. W. Evans, Rosewood	4.309·7	256·766	Roseview Peer
Hopewell Sunflower	G. Harley, Childers	5.358·2	256·408	Trinity Daffodil's Design
Pinegrove Lucy	J. W. Evans, Rosewood	4.858·7	248·443	Roseview Peer
Carnation Joy	W. Spresser and Sons, Ipswich	4,884·55	247·77	Rosslyn Royal Trigger
Trecarne Some Eileen 2nd	T. A. Petherick, Lockyer	5,102·55	244·355	Trecarne Ruler 2nd

GUERNSEY.

JUNIOR. 2 YEARS (STANDARD 230 LB.)

Laureldale Pet	W. A. K. Cooke, Witta	6,325·9	319·431	Minnamurra Topsy's Sequel 2nd

The Pig Farm

Export Baconer Pigs.

BRISBANE ROYAL NATIONAL SHOW, 1947.

F. BOSTOCK, Officer-in-Charge, Pig Branch.

CONTINUING the policy of offering encouragement to pig raisers to produce the most desirable class of export baconer pigs, the Royal National Agricultural and Industrial Society at its 1947 Exhibition again provided a class for these pigs, conditions being similar to those of last year; however, a recommendation is to be made to the Society by the Australian Pig Society that exhibitors in future be allowed to dispose of the pigs entered in commercial classes in whatever manner they choose, and not necessarily slaughtered, as under the present rules.

Prize money of £40 was provided for this class, of which £25 was presented by the Department of Agriculture and Stock, in addition to £4 4s. by the Australian Pig Society, Queensland Branch, and £3 3s. by the Queensland Co-operative Bacon Association Ltd.

Each entry consisted of three baconer pigs, either pure bred or sired by a pure-bred boar, and each pig between 180 lb. and 220 lb. live weight.

Five entries were submitted and weighed under supervision of the stewards at 2 p.m. on Friday, 8th August, 1947, the middle-weight pig from each entry being selected for slaughter and forwarded to the Brisbane Abattoir immediately after live judging was completed by Mr. C. Shelton, who used a score card which provided 45 points for condition, 45 points for uniformity to type, and 10 points for general appearance.

The pigs were slaughtered at the abattoir, and after being chilled were judged by Mr. F. Bostock, judging being based on the system of carcass judging evolved in England and known as the Hammond system.

A feature of the competition was that the live judging corresponded with the carcass awards in respect to the first three placings, the only variation being that fourth and fifth in the live judging were fifth and fourth when the allotted points to carcass judging were added.

The pigs when judged alive were particularly good, no pen scoring below 90 points, and only 6 points separating the first and last pen.

In the carcass appraisal, eye muscle development was good in the first prize, but only fair to good in the remainder.

Backfat was good in the second, third, and fourth prizes; however, the first prize did not carry a sufficient proportion and the fifth prize was a little overfat.

Body length, a very important section of carcass judging, was disappointing, and although the carcasses appeared to have plenty of length overall, indications were that the lengths of middles were short in comparison to forequarters and when compared with the standard as set down by the judging system used, the highest points scored being 13 points out of a possible 20 points.

Considerably more attention should be given to this most important feature.

Leg length, which gives an indication of bone development, was good in all except one case, when only one point was scored out of a maximum of five points.

Breeders are urged to give this class special attention, and now that it has been recommended that pigs in commercial sections need not necessarily be slaughtered it is hoped that at next year's Exhibition not only white pigs will be exhibited but that representatives of all breeds will be shown, because the information gained by a study of the points allotted are of immense value and indicate to farmers the class of carcass required for the export market and the type of animal that will produce such a carcass.

The marks awarded each section, both for live judging and carcass appraisal, are given in detail in the accompanying tables, this affording an excellent means of comparison of each feature.

Illustrations of one side with the sections of the opposite side cut at the last rib afford another means of comparison and provide information of value to interested farmers.

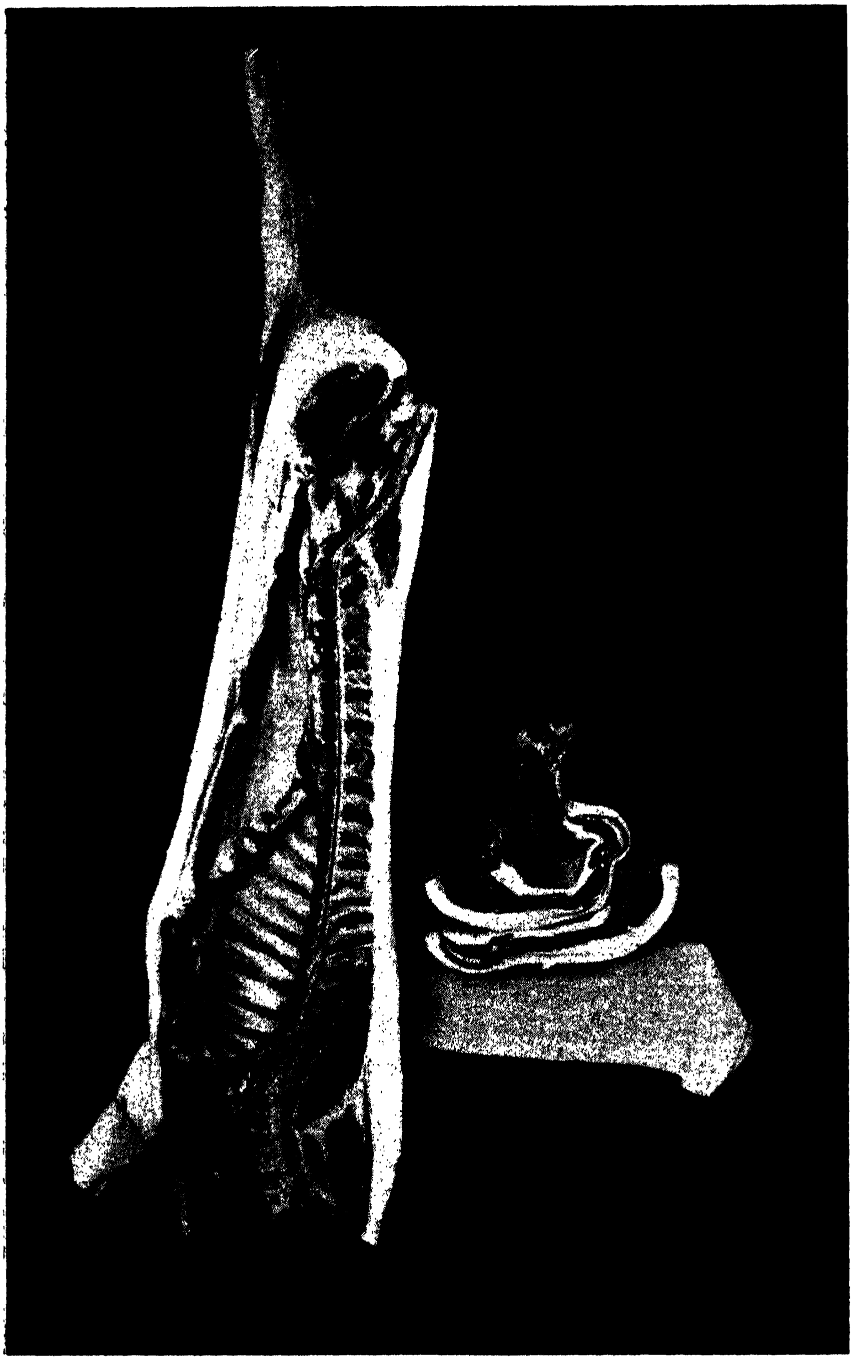


Plate 69.
446—FIRST PRIZE.—LARGE WHITE × BERKSHIRE.
Exhibited by Messrs. H. J. Franke and Sons.

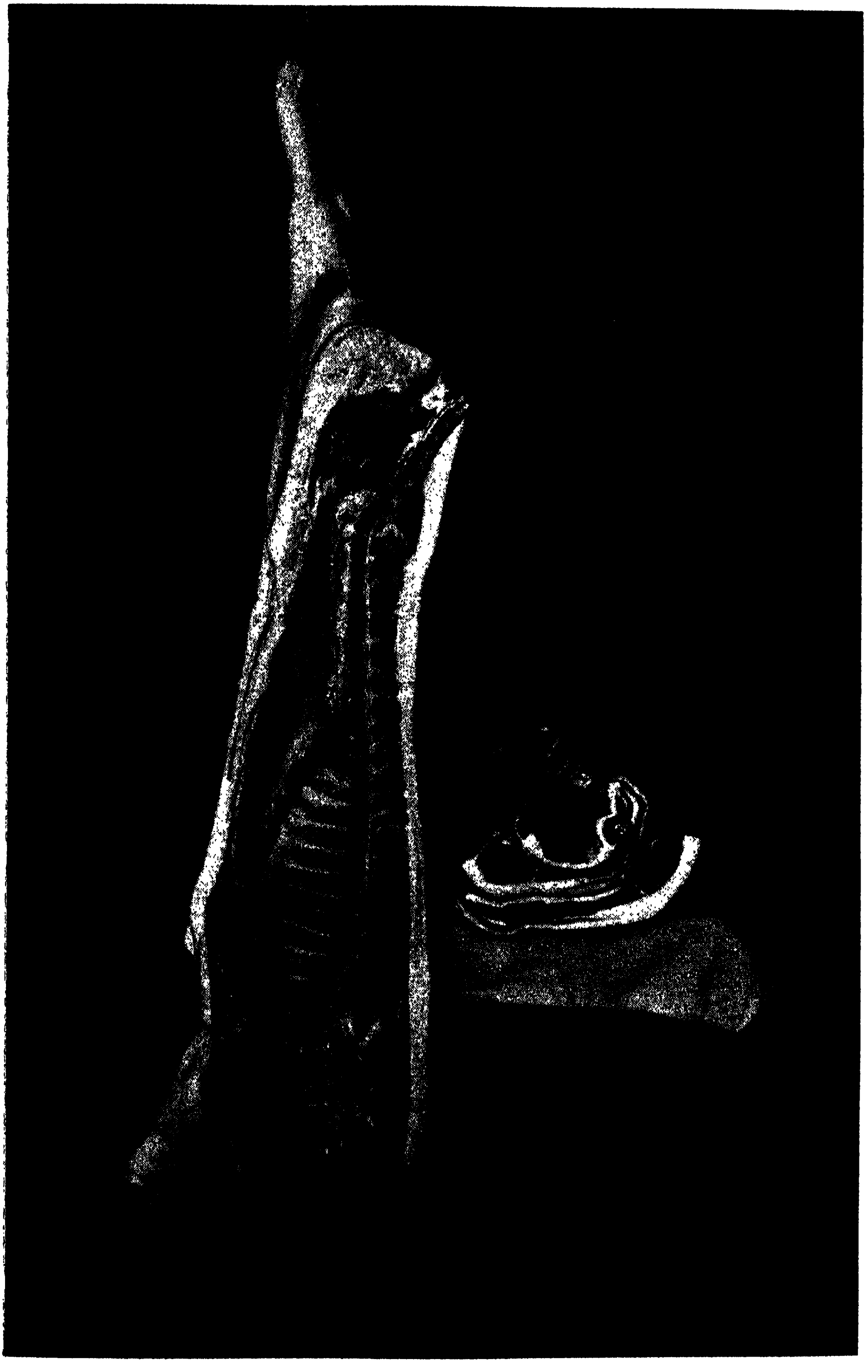


Plate 70.

447—SECOND PRIZE.—LARGE WHITE × LARGE WHITE.

Exhibited by Mr. K. B. Jones.

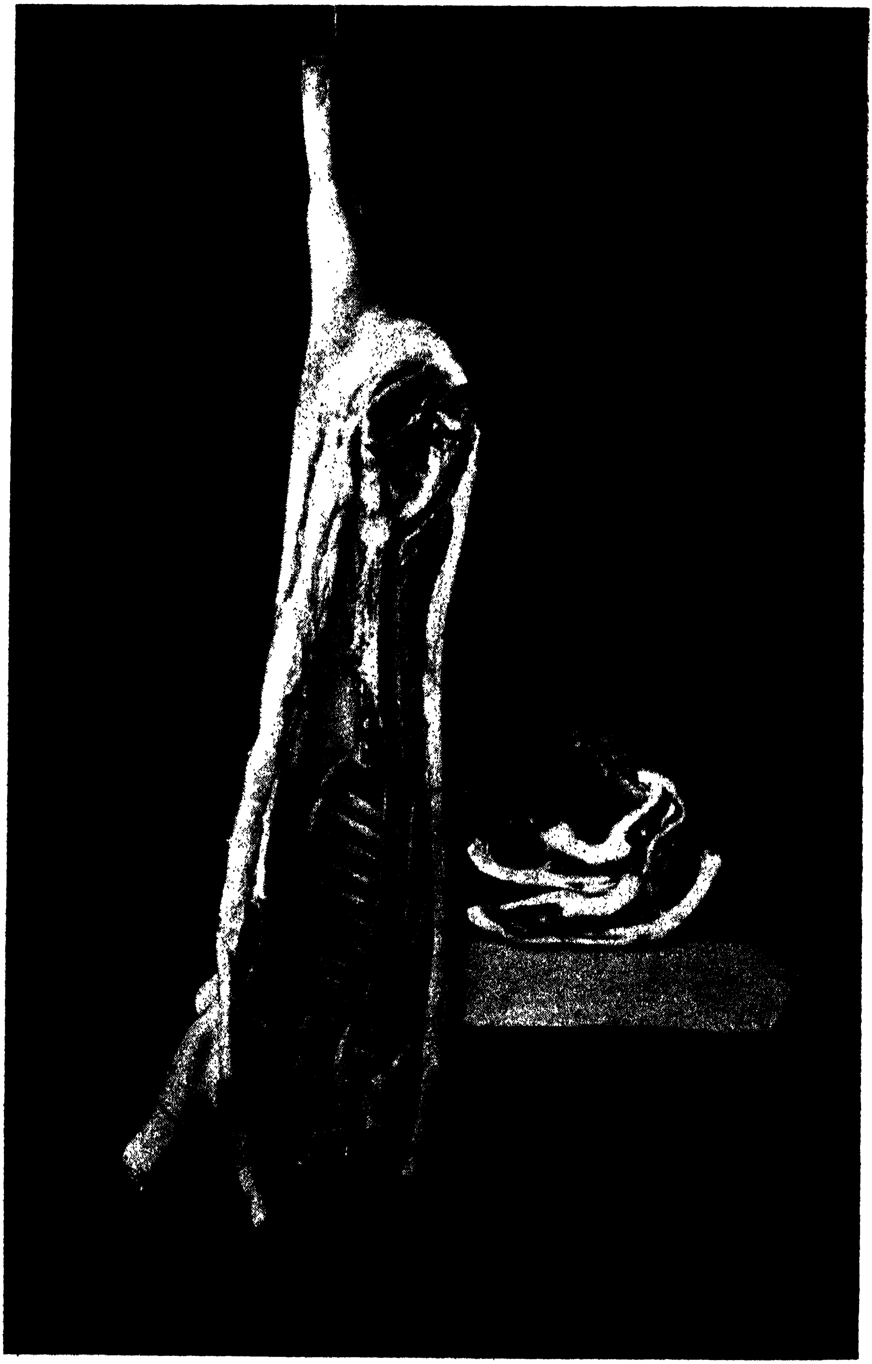


Plate 71.
448—THIRD PRIZE.—LARGE WHITE × LARGE WHITE.
Exhibited by Mr. N. E. Meyers.

Plate 72.
449—FOURTH PRIZE.—LARGE WHITE × LARGE WHITE.
Exhibited by the Q.A.H.S. and College.

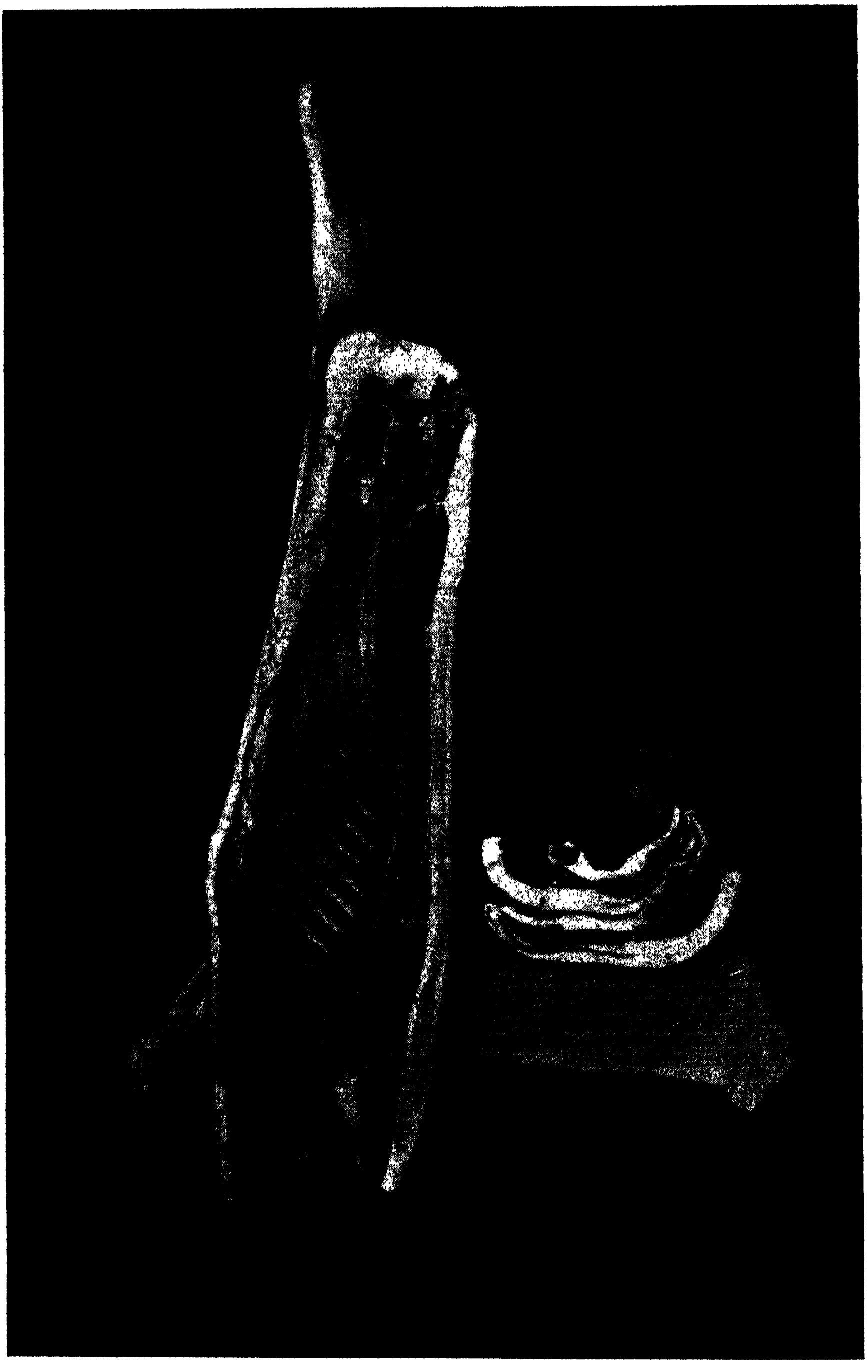


Plate 73.

445—FIFTH PRIZE.—LARGE WHITE × LARGE WHITE.
Exhibited by Messrs. T. Bradshaw and Son.

DETAILED RESULTS OF "SPECIAL EXPORT BACONER PIGS" COMPETITION, ROYAL NATIONAL SHOW, 1947.

MIDDLE WEIGHT PIG APPRAISED AT THE BRISBANE ABATTOIR.

Weight Range 180–220 lb.	Points for Live Pig							—													
No. of Entry	Live Weight	Dressed Weight	Per cent. loss in dressing	Condition	Uniformity and Type	General Appearance	Total	Skin	Firmness of Fat	Hams	Shoulders	Streak	Total	Eye Muscle	Back Fat	Body Length	Leg Length	Total	Total Appraisal Points	Grand Total	Award Aggregate
				45	45	10	100	5	10	8	7	12	42	28	20	20	5	73	115	215	
445	196	154	21·42	42	41	8	91	4½	9½	7	6	9½	36½	44 mm. 18	28 mm. 10	733 mm. 2	562 mm. 5	35	71½	162½	Fifth place 75·58%
446	214	174	18·69	43	44	9	96	5	9½	6½	6½	10	37½	50 mm. 23	18 mm. 15	822 mm. 11	599 mm. 4	53	90½	186½	First place 86·74%
447	196	143	27·00	43	43	9	95	4½	9	6	6	10	35½	39 mm. 13	19 mm. 19	772 mm. 13	565 mm. 4	49	84½	179½	Second place 83·48%
448	187	152	18·71	42	41	9	92	4½	9	6	6½	10	36	45 mm. 19	20 mm. 19	752 mm. 5	560 mm. 5	48	84	176	Third place 81·86%
449	202	148	26·73	41	41	8	90	4½	9	6	6½	10½	36½	40 mm. 14	22 mm. 18	760 mm. 9	595 mm. 1	42	78½	168½	Fourth place 78·37%

The 1947 Brisbane Exhibition.

Plate 74.

HIS EXCELLENCY THE GOVERNOR, LIEUTENANT-GENERAL SIR JOHN DUDLEY LAVARACK, K.B.E., C.B., C.M.G., D.S.O., AND LADY LAVARACK, ON THEIR ARRIVAL, WERE RECEIVED BY THE PREMIER, HON. EDWARD M. HANLON, M.L.A.

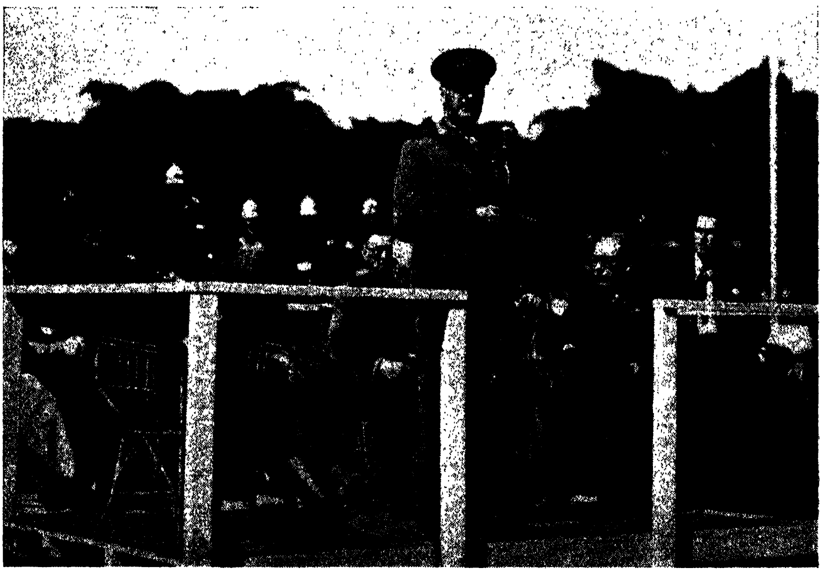


Plate 75.

THE GOVERNOR OF QUEENSLAND, LIEUTENANT-GENERAL SIR JOHN DUDLEY LAVARACK, OPENING THE 1947 BRISBANE EXHIBITION. SEATED ON THE DAIS (RIGHT) IS THE PREMIER OF QUEENSLAND, HON. EDWARD M. HANLON.

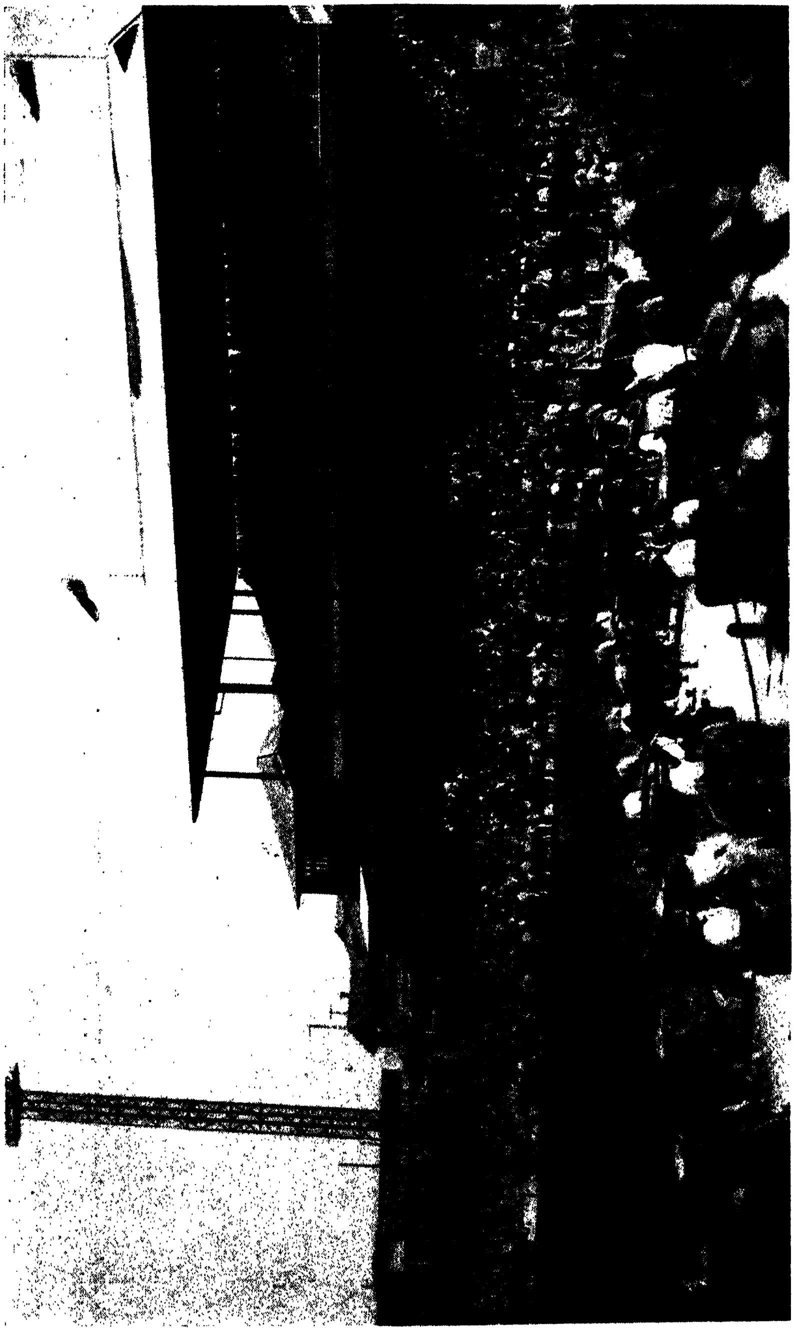


Plate 76.

BRISBANE EXHIBITION, 1947.—Section of the Pedigreed Stock Parade.

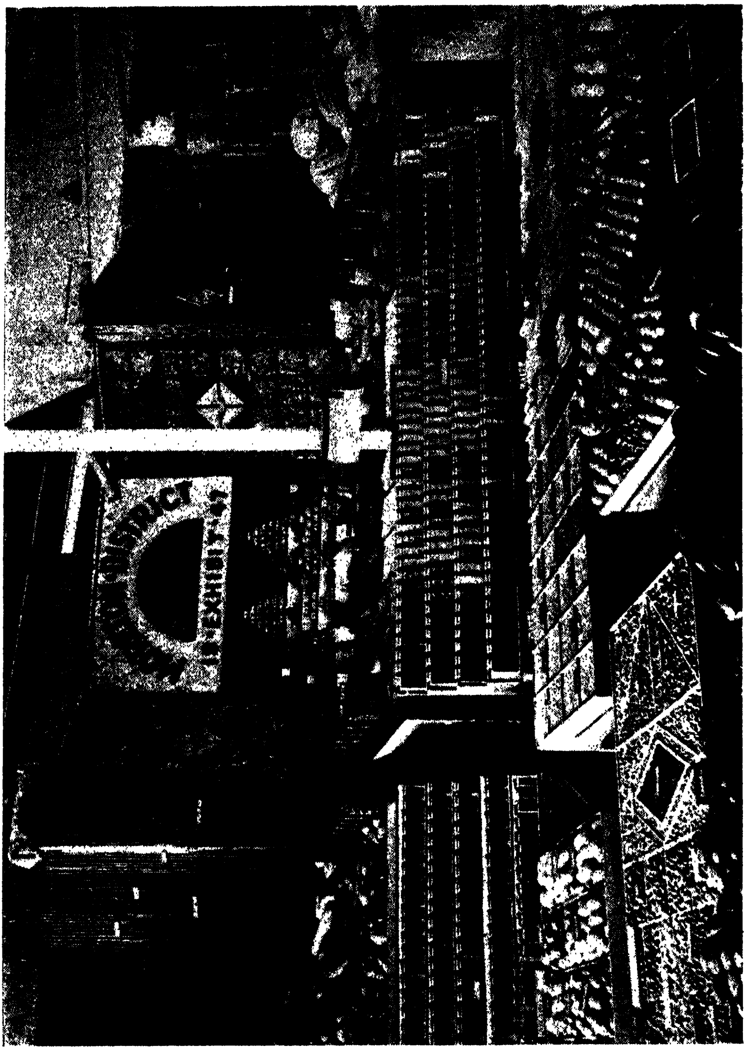


Plate 77.
THE WINNING DISTRICT EXHIBIT.

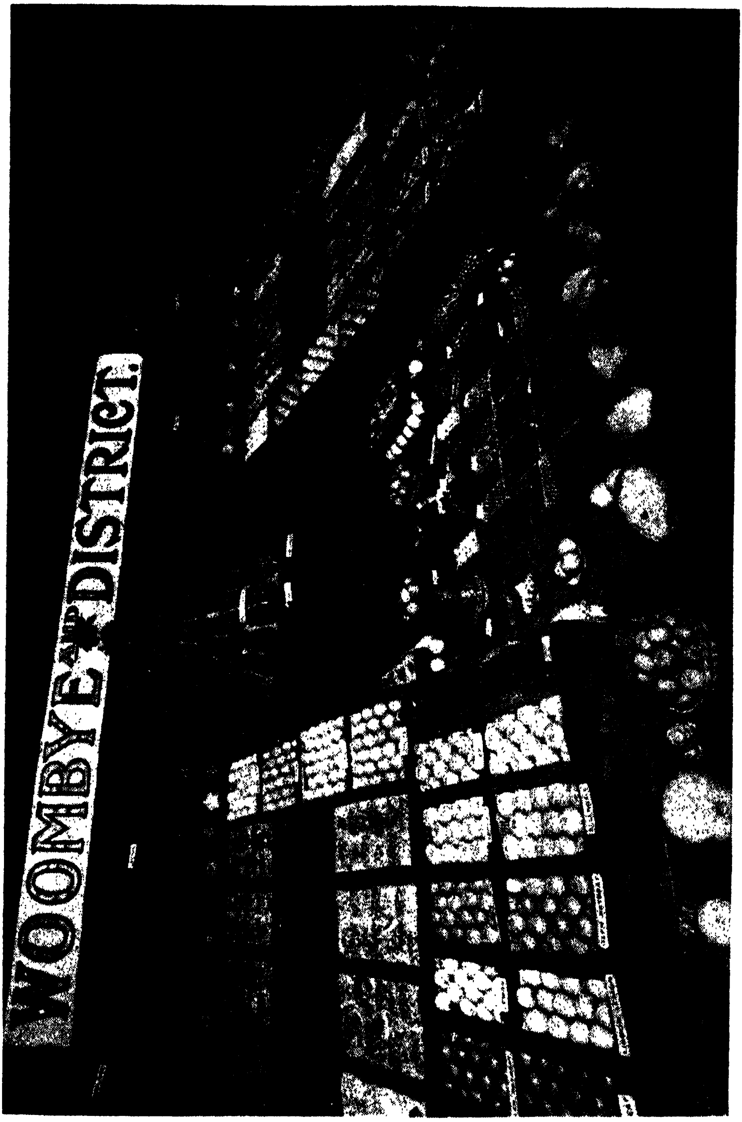


Plate 78.

A WINNING FRUIT DISPLAY.

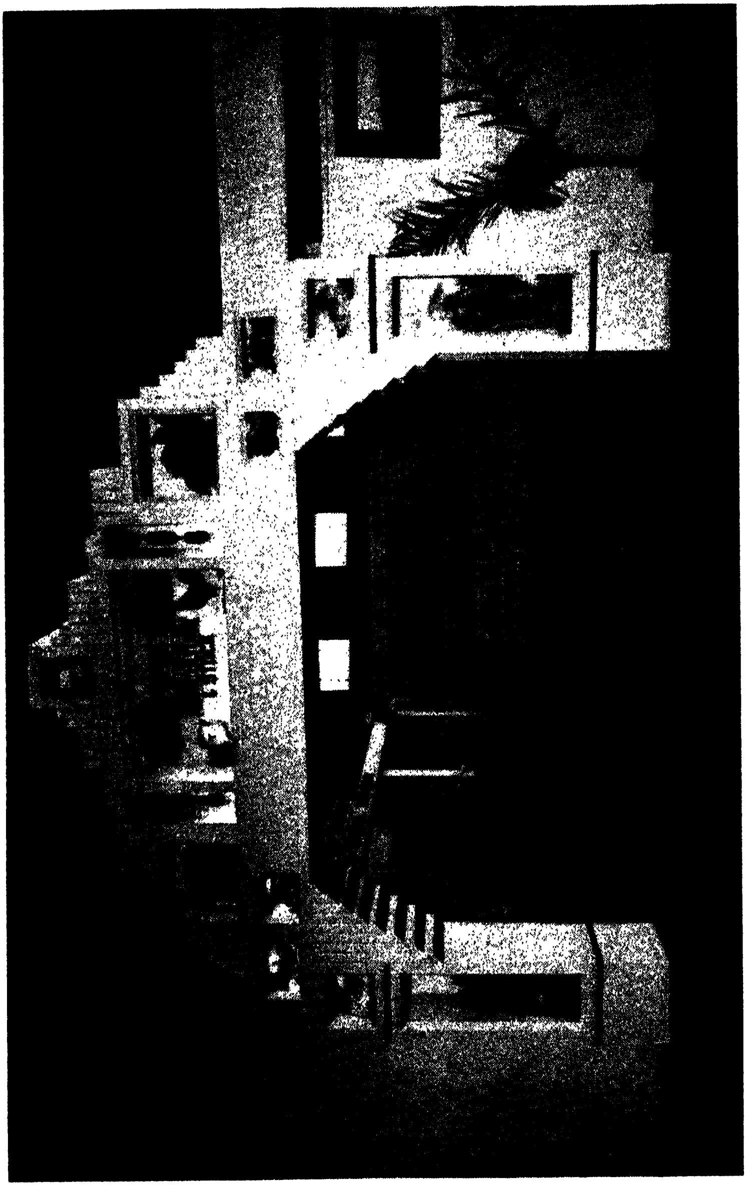


Plate 79.

ENTRANCE TO THE COURT OF THE DEPARTMENT OF AGRICULTURE BEFORE THE CROWD CAME.

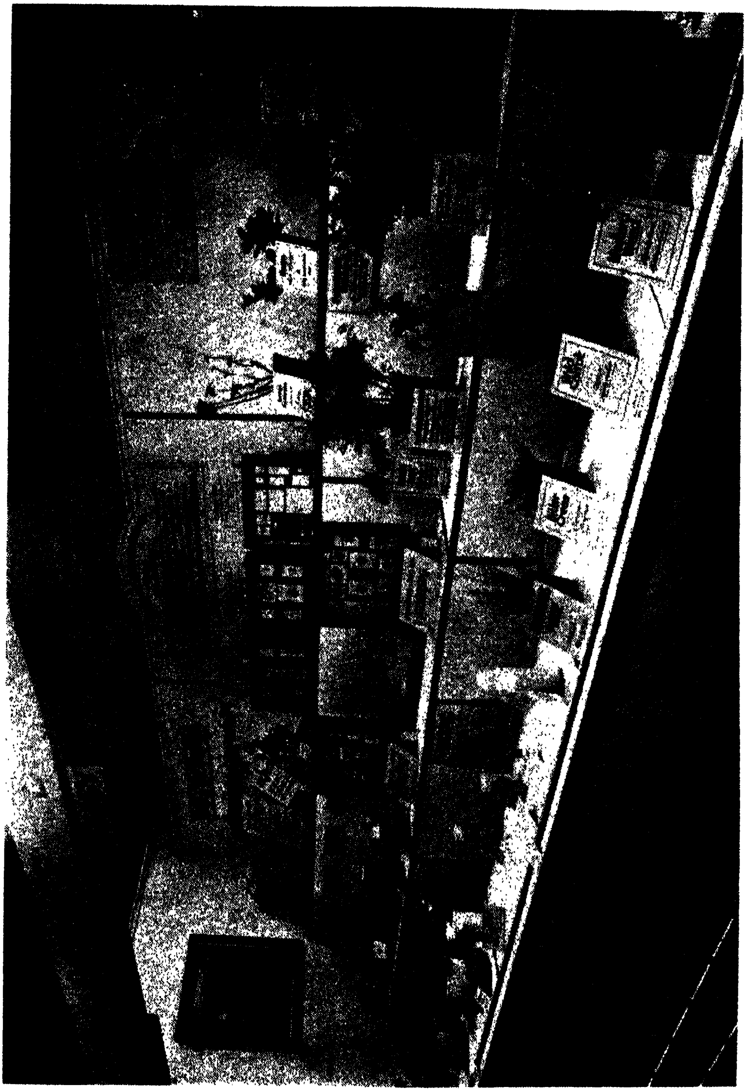


Plate 80.

THE SERVICE OF SCIENCE TO RURAL INDUSTRIES.

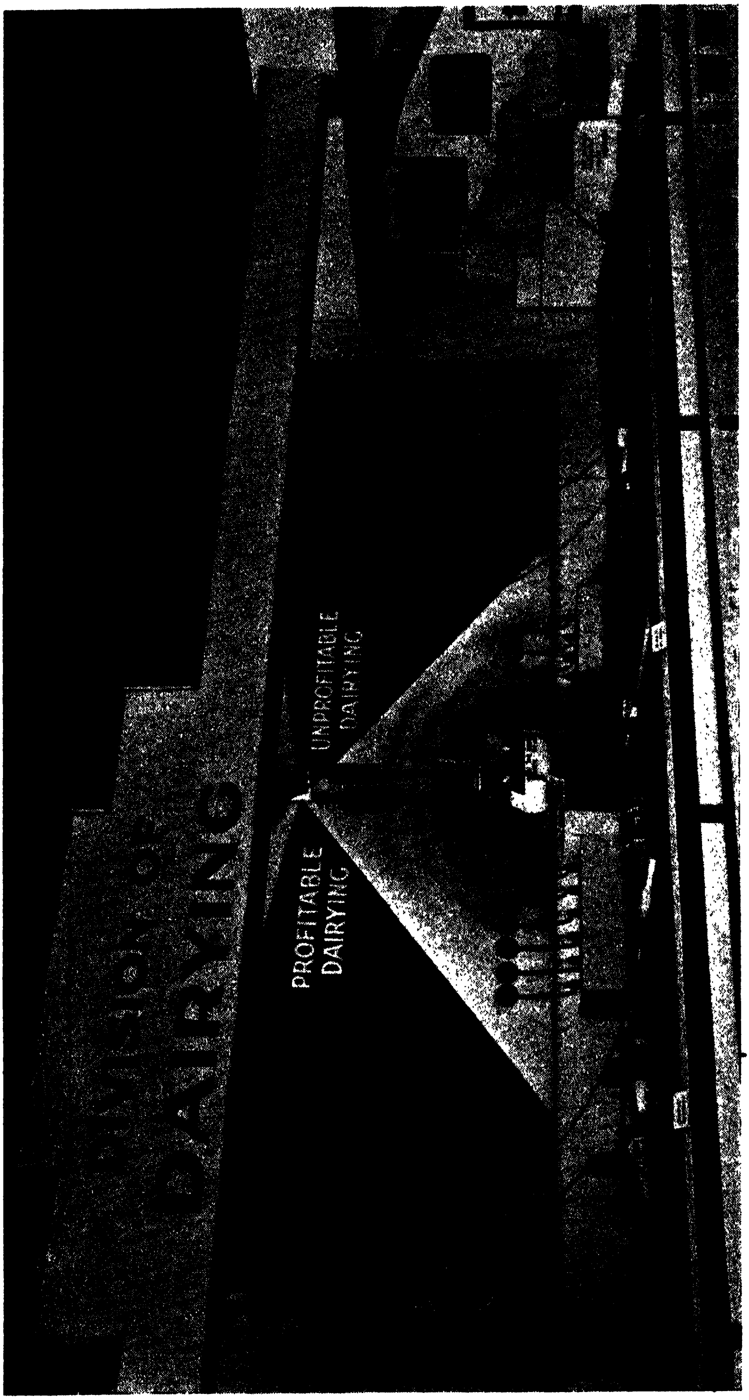


Plate 81.

AN EDUCATIONAL CONTRAST IN THE DISPLAY OF THE DIVISION OF DAIRYING.

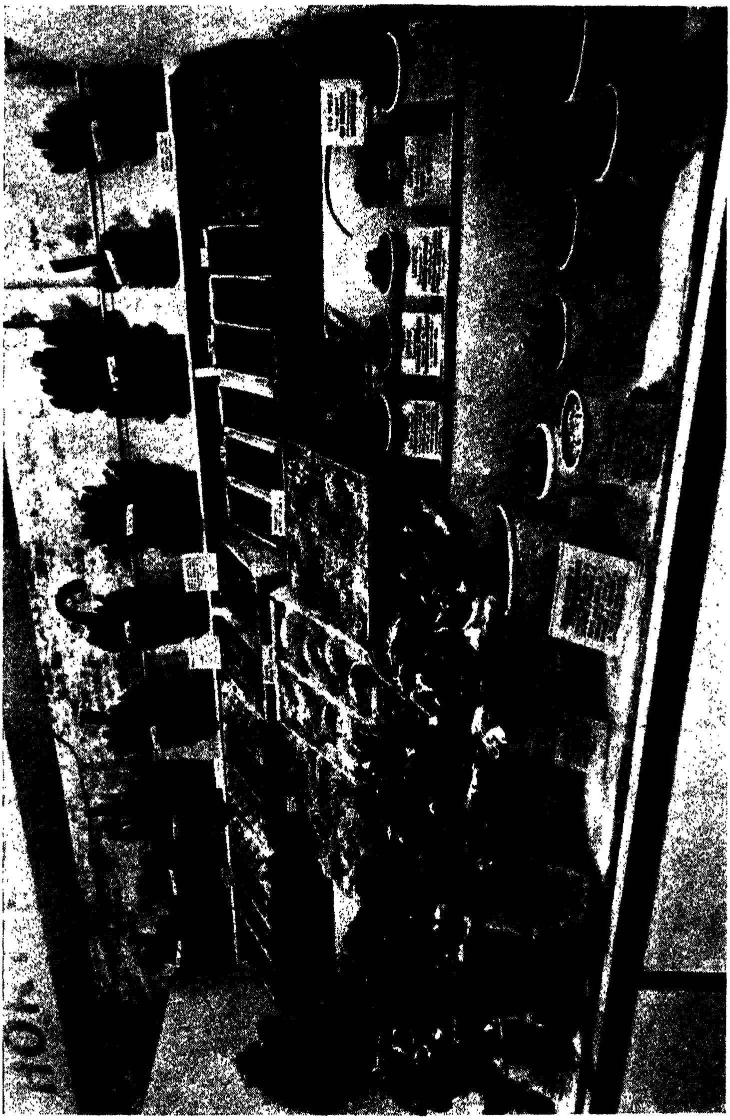


Plate 82.

ORCHARD PRACTICE AND ITS PRODUCTS WERE WELL ILLUSTRATED IN THE COURT OF THE DEPARTMENT OF AGRICULTURE.

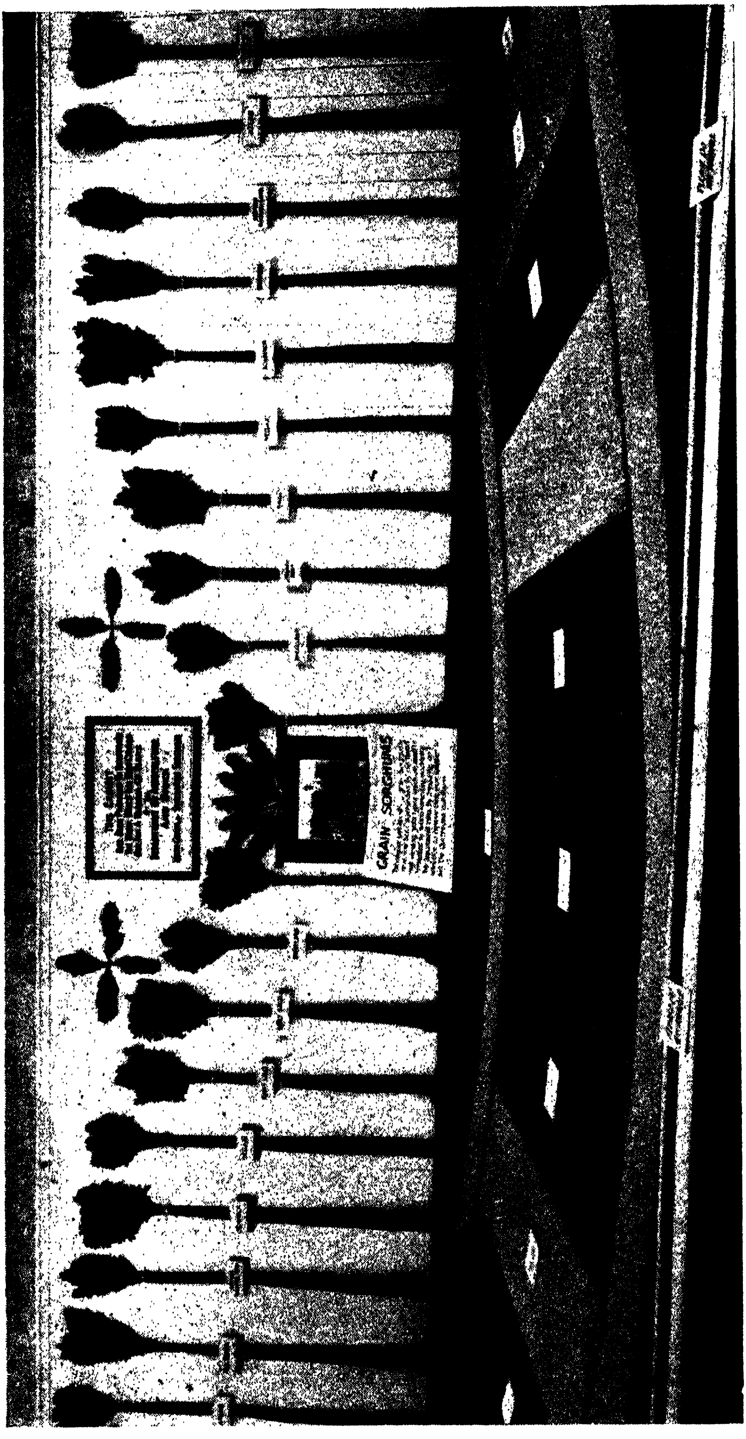


Plate 83.
GRAIN SORGHUM IN SHEAF AND GRAIN.

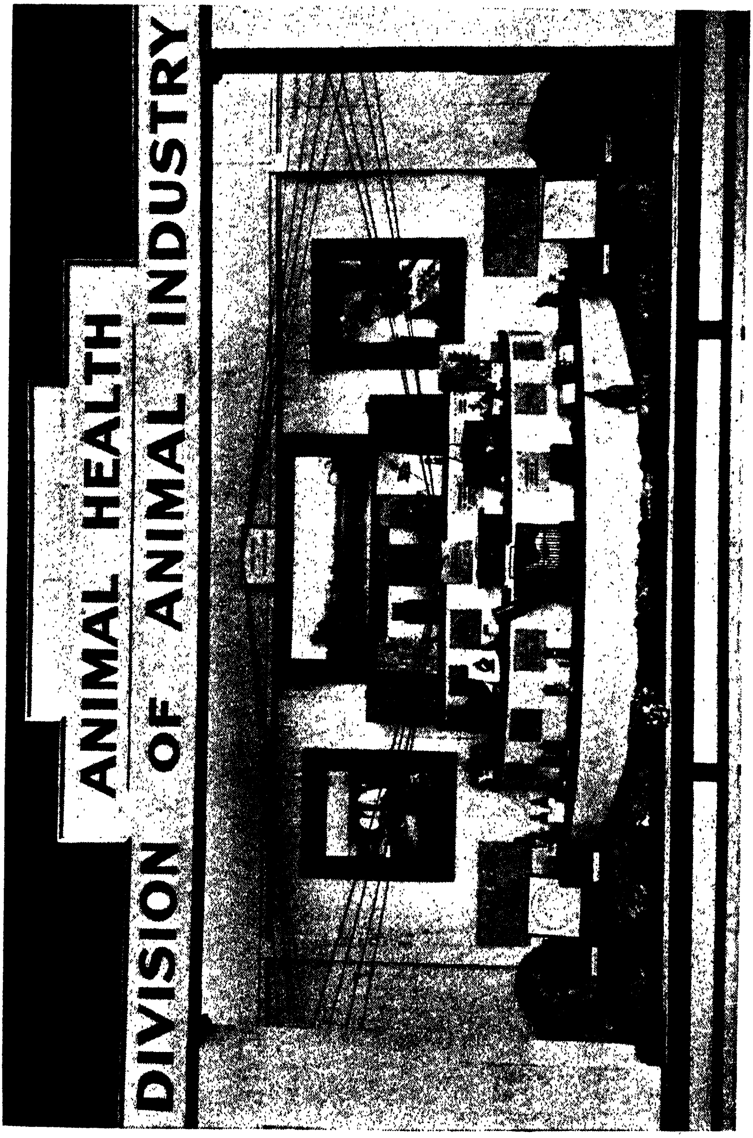


Plate 84.

VETERINARY SCIENCE AND ITS TIES WITH THE LAND INDUSTRIES WAS THE THEME OF THIS DISPLAY.

Plate 85.

THE LINK BETWEEN THE LAND AND THE LABORATORY.

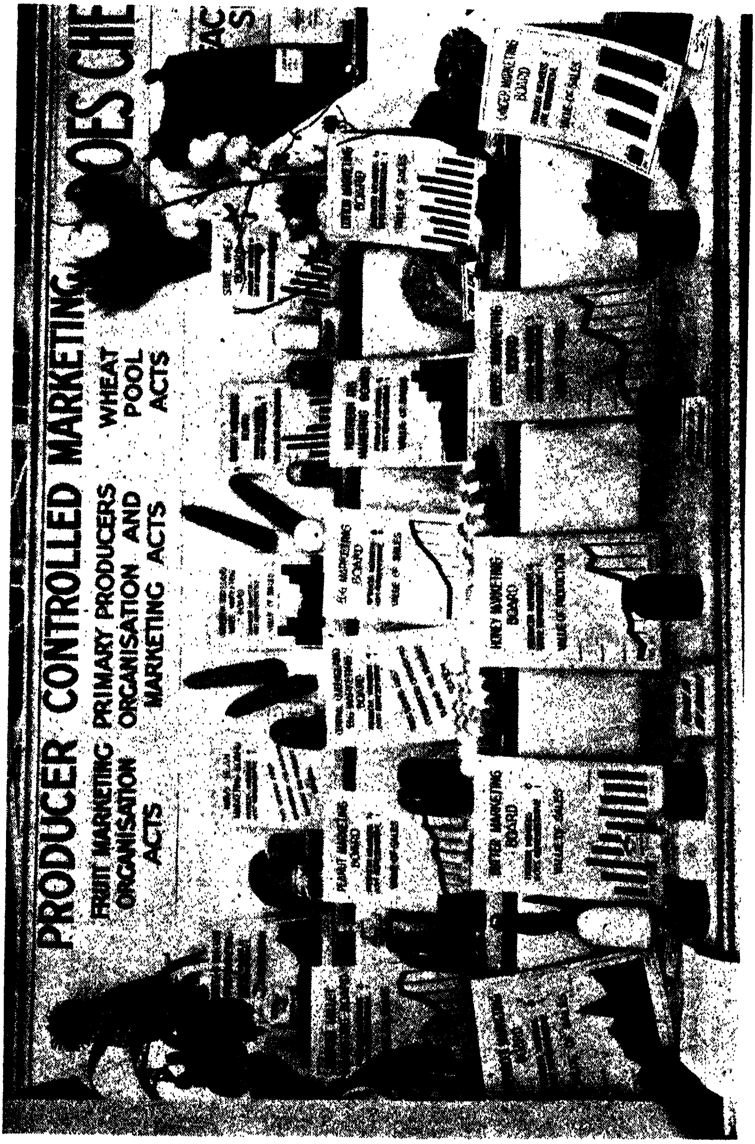


Plate 86.

THE FARMER AND HIS MARKET.—The Economics of Agriculture Well Illustrated in the Display of the Division of Marketing.

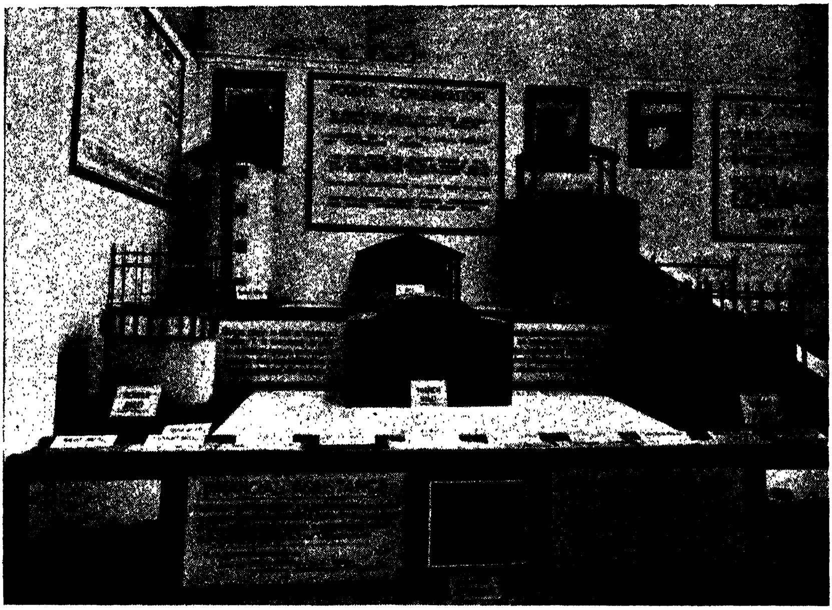


Plate 87.

HOW TO STORE STOCK FOOD.—Scale Models of Silos—trench, pit, stack, and tower—illustrated the case for Fodder Conservation.

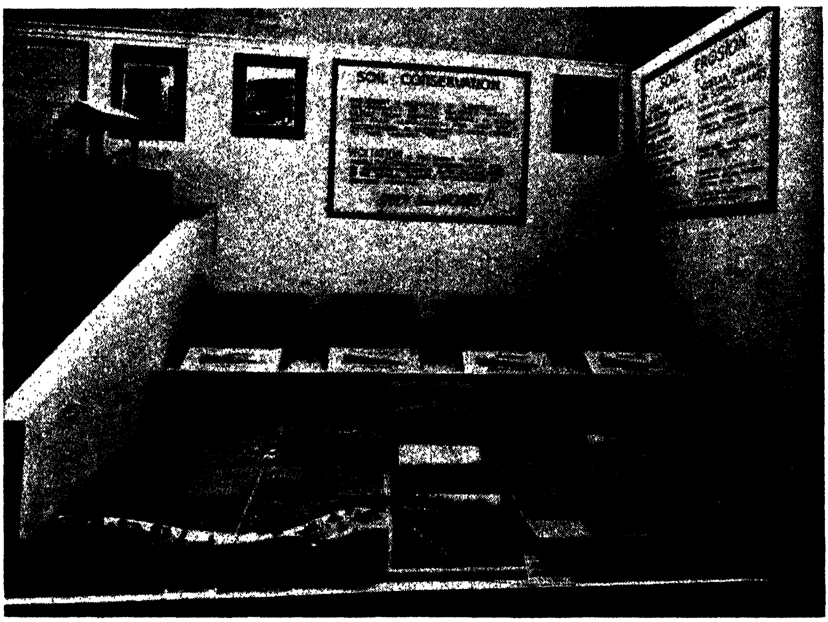


Plate 88.

LAND TO HAVE AND TO HOLD.—Scale Model Farms showed how soil is saved—and lost.

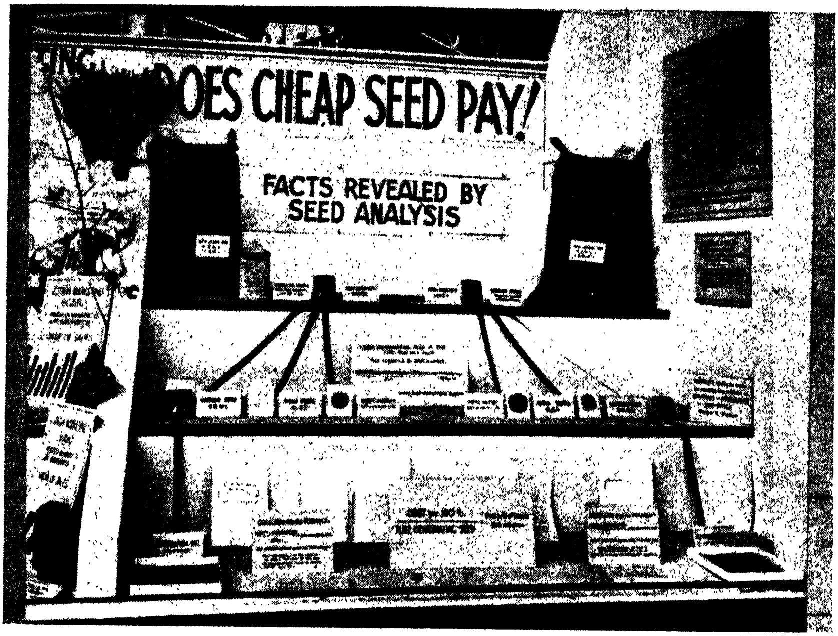


Plate 89.

THE STANDARDS BRANCH SHOWED HOW THE FARMER IS PROTECTED IN HIS SEED AND OTHER PURCHASES.

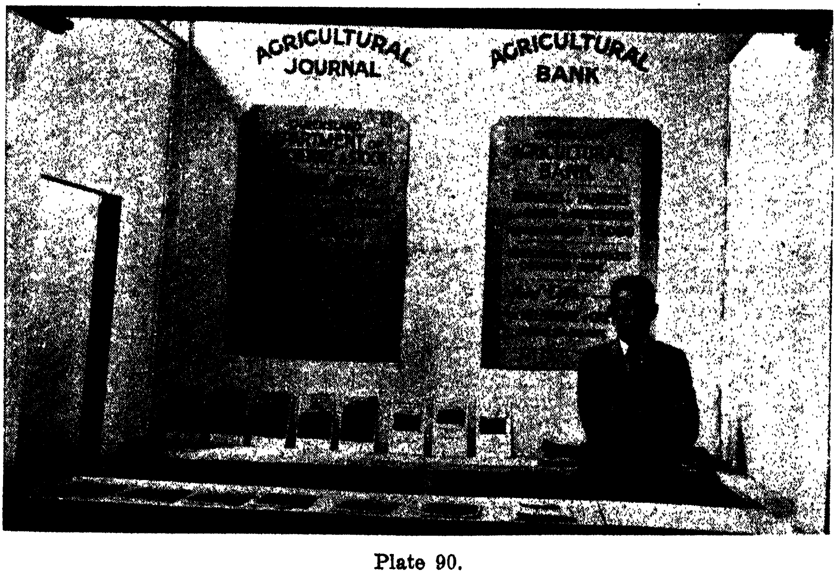


Plate 90.

THE JOURNAL CORNER OF THE DEPARTMENTAL COURT.—Mr. George Thompson in charge.

MARKETING

Production Trends—August.

Dairy cattle have wintered well and are in fair to good condition. Relief rains in most dairying districts cause a renewal of the growth of herbage and fodder crops and, although pastures were dry, there was a good body of rough grass in most districts.

On the Atherton Tableland 9,500 tons of maize had been delivered to the Atherton Tableland Maize Marketing Board by the end of August. It is expected that the crop in that area will total 19,000 tons. Excellent yields are reported from the South Burnett, but the crop is expected to be below average on the Darling Downs.

The long period of favourable weather for cotton harvesting was broken at mid-August and again at the end of the month by general rains. Generally, the grades for the season have been surprisingly good considering the seasonal conditions.

Tobacco leaf from the Texas, Yelarbon, and Inglewood districts cured fairly bright with fair to good body, but on the average quality was below that of the previous season. It is estimated that the yield from these districts will be 928,000 lb. It is expected that 950,000 lb. of leaf will be appraised from the Mareeba-Dimbulah area.

Some early sowings of wheat on the Darling Downs were beginning to come into ear by the end of the month.

With the exception of a few mills, crushing of sugar cane was in full swing in all areas during the month. Indications are that some far northern mills will exceed estimates, but in most central and southern areas the trend is downward. The Queensland estimate of 550,000 tons of sugar remains unchanged.

Maltings Premises.

Arrangements have been made by the Barley Marketing Board to rent the maltings premises at Black Gully, Toowoomba, from the Queensland State Wheat Board for the coming season. This will provide intake and storage facilities which will enable the Board to take delivery of barley from growers with greater despatch than has been the case for some years.

Tobacco Marketing.

The Commonwealth Department of Commerce and Agriculture and the Departments of Agriculture of the tobacco-growing States are examining proposals to constitute an organization for the orderly marketing of tobacco leaf to replace the existing marketing organization which was established during the war under the *National Security (Australian Tobacco Leaf) Regulations.*

Legislation will require to be enacted by the States, with complementary Commonwealth legislation. The Marketing Division of the Department is at present engaged, at the request of the Australian Agricultural Council, in drafting a model bill for early submission to the other tobacco-growing States of Western Australia, Victoria and New South Wales.

New Zealand Dairy Commission.

The New Zealand Prime Minister (Right Hon. P. Fraser) has announced intention of his Government to introduce legislation to set up a New Zealand Dairy Commission to determine the guaranteed price for dairy produce each season, and to administer the marketing of the industry's products. The Commission will have a chairman appointed by the Government and equal representation of the Government and the industry

GENERAL NOTES

Staff Changes and Appointments.

The designation of the position held by Mr. W. G. Wells, of the Department of Agriculture and Stock, has been altered from Specialist Adviser, Experiment Stations, also Cotton Specialist, to Director of Regional Experiment Stations.

Farmers' Wool Disposal Scheme.

The Farmers' Wool Scheme was originated by the Department of Agriculture and Stock with the object of ensuring that the small sheep owner received full value for his wool. It has grown from small beginnings to a business of considerable size. During the past season, 747 bales were classed on behalf of 267 growers, and at the last sale of the season, a price of 46½d. per lb. was realised for one bale, which topped the catalogue of the selling broker for the day.

One of the main objects of the scheme is the bulking of wools of similar type and quality to avoid star lots. The bulk lots are sold on the main floor and participate in competition from overseas buyers.

Farmers owning 1,500 sheep or fewer are given a first advance by the Department of Agriculture and Stock of 60 per cent. of the estimated value of the consignment without any interest charge. The wool is weighed on arrival at the Department and is then classed and repacked, for which a charge of ¾d. per lb. is made. Other charges are those which would be normally incurred in the ordinary course of business.

Consignments are treated in the order of their receival, though at times it is necessary to hold a line until a suitable matching is available, and it is because of this possible delay that the first advance is made to the farmer.

All wool received is handled by expert classers and even locks go over the table.

Panicum and Millet Seeds for Sowing.

The Minister for Agriculture, Hon. H. H. Collins, in commenting on the current demand for panicum and millets said that the producers of these grains should take steps to reserve sufficient seed for the coming plantings. Most of Queensland's production of these grains is sold in Southern States or exported; consequently, it would be necessary to rely upon stocks held in Queensland for the next plantings.

THE AUSTRALIAN PLAGUE LOCUST.

Last year, outbreaks of the Australian plague locust occurred in the three eastern States. Such outbreaks usually last for three years or so. Hopper swarms may therefore prove troublesome in Southern Queensland this spring. Hatching has been reported already from Dirranbandi and Mr. Weddell, an entomologist of the Department of Agriculture, has left for this and other areas where outbreaks may be expected. He will be accompanied by Stock Inspectors familiar with the local situation and will thoroughly investigate the position.

Poison bran baits will be used extensively if an attack occurs in the more closely settled districts. Arsenic pentoxide was the poison used in these baits during earlier campaigns against the pest. However, the new insecticide gammexane is more efficient than arsenic pentoxide and it is virtually non-poisonous to stock. Gammexane will therefore replace arsenic pentoxide wherever possible. Limited stocks of gammexane are available in Brisbane but they should be sufficient for current requirements. Additional supplies will be obtained by the distributors (A.C.F. & Shirleys Fertilizers Ltd.) as soon as possible.

Should a control campaign be required on the Darling Downs, the Department of Agriculture will co-operate in every possible way with the Local Authorities who supervise the application of the bait within their boundaries.

GADGETS AND WRINKLES

THE TANK SITE.

Very careful consideration should be given to the selection of a site for a tank. The most important point is a good catchment, and this, on some holdings, is almost the sole determining factor.

In undulating country catchments are generally good, and no difficulty is experienced, but in the flat country of the western plains levels should be taken. Tanks have been made where water would not flow into them and land often appears level when it has a fall of several inches.

Very often shallow watercourses exist, and the tank should be located on or near these. Roads provide satisfactory catchments, and a good flow of water can be obtained off the hard bare patches which exist on the plains.

In selecting catchment attention should be given to the nature of the country; for instance, a drain running over hard compact soil will carry more water into the tank than one running over black soil, which develops large cracks during drought periods, and which absorbs a large amount of water before any reaches the tank.

The catchment must have sufficient area to catch enough water to fill the excavation in good heavy rains; a large area with a gentle grade is preferable to too steep a catchment, for with the latter serious scouring is likely to occur, with increased silting of the tank itself during heavy rains.

Guard Against Pollution.

Tanks or dams may be placed so as to water more than one paddock if required. If the paddocks are large, however, it is better to place the excavations as near the centre as possible, in order that stock may not have to travel too far to water, and will not tread down the grass so much going to and fro.

See that the area is kept clean and does not contain pigsties, sheepyards, &c.

Shade-trees should not be left in the catchment, but rather below it, so that the excreta from stock camping under them may not be washed into the tank and pollute the water.

Stock come to water in the morning and like to linger round in the shade, taking frequent drinks before moving off in the afternoon.

If shade is not available they probably take only one drink in the day, and consequently do not do as well as they otherwise would.

Sink Trial Shafts.

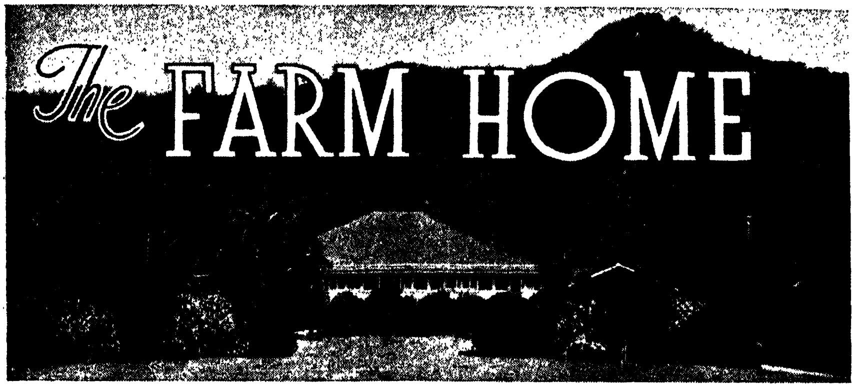
After locating what is apparently a good site, the nature of the soil should be ascertained. On some country a tank will hold well almost anywhere, but in other classes of soil some considerable difficulty is experienced, and recourse must be made in some cases to puddling.

The nature of the timber is usually indicative of the character of the subsoil, but is not always reliable.

Occasionally the country is patchy; while the subsoil in portion of the tank is good, a band of a porous character may be struck, which will cause a leakage.

Before sinking is commenced trial shafts should be sunk to the depth it is proposed to excavate the tank, and if it is considered the country is patchy two or three should be put down.

An experienced man can tell by the nature of the subosil whether or not it will be "good holding," but if there is any doubt a test should be made by partly filling the shaft with water, so that its holding capacity can be ascertained.—*N.S.W. Agricultural Department Extension Service.*



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BETWEEN TWO YEARS AND SIX.

IN these days of progress in health matters one of the outstanding achievements of science is the increase in our knowledge of the care and education of children. We understand better than ever before the facts of bodily and mental growth and development and the influences which affect this development.

The child of today has a better chance than the child of 10 or 20 years age to grow into a useful citizen and live to a ripe old age. Progress in medical science, the work of child welfare organizations and other social services and the amount of education available to parents are all helping in this much-to-be desired result.

Nevertheless, we still find many children physically under-developed, mentally retarded, emotionally unstable and badly adjusted to their environment. The combined efforts of parents and welfare workers must operate continuously to ensure that every child has the chance of a full and satisfactory life.

Too many mothers think that once the "baby stage"—*i.e.*, the first year or 18 months—is over the most worrying part of their child's life is past. But this is not so. The change from infancy to childhood comes between two years and six and is a period of great physical and mental growth. Because of this it is most important that parents should not relax their care and watchfulness of the child after his first year. The problems that confront the conscientious parent require more than instinct for their solution and in a short series of articles we hope to point out how the toddler or pre-school child may be kept well and his mind and body developed in a healthy, normal way.

It should be remembered, however, that books and articles cannot take the place of the doctor at your toddler's health centre, if there is one in your district, or your family doctor or the sister at your local welfare centre who has probably helped you through the ups and downs of the child's baby days.

So remember to keep your toddler weighed regularly and have his diet checked and see that he has a complete physical examination by a doctor preferably once each six months but at least once a year. The dentist should examine the child's teeth every six months also. When periodic health examinations are made by the same doctor each time it is easier for him to detect disturbances of growth in time to prevent permanent physical defects or correct those which have developed. Faulty mental habits may also be checked before they lead to permanent trouble. Watch for the next two to six years' talk.

Further advice on this and other matters can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters, *Baby Clinic, Brisbane*. These letters need not be stamped.

IN THE FARM KITCHEN.

Cook Potatoes Properly.

Potatoes supply the vitamins A, B, C, and D, all of which are necessary to health. If they are unduly fattening, it is mainly because of the method of cooking. They are often fried in fat insufficiently hot, and so they absorb the fat, or they are not properly drained after being fried, or they are peeled so thickly and the "eyes" taken out so badly that much of the valuable outer layer is lost and little but the starchy parts remain. Consequently, they are inclined to be more fattening than nourishing. Potatoes are also boiled day after day instead of being steamed, and often they are allowed to get mushy, which means that again it is chiefly the starchy part which is left. Preserve the good of the potato when cooking the vegetable. Either roast them or boil or steam them in their jackets. Provided the peeling is done thinly, cooking potatoes in a stew, broth, or any casserole dish is an excellent way of conserving all their nourishment. Potatoes are very useful vegetables, they can be added to so many casserole dishes, served in so many different ways. Serve left-over potatoes in salads or in fish or meat rissoles. Left-over potatoes made into potato cakes are delicious at tea-time, and very handy for breakfast.

Parsley Savoury.

Mix together some sieved breadcrumbs, chopped parsley, onion, thyme, marjoram, and a nut of dripping, and moisten with cold water. Put into a greased dish and cook in the oven for about ten minutes. A sage savoury is made in the same way with breadcrumbs, onion, sage, dripping, and water.

Jubilee Loaf.

Six ounces of self-raising flour, 1 oz. butter, 1 oz. sugar, 3 oz. mixed fruit, 1 egg, ½ cup milk, pinch salt, nutmeg or spice, vanilla. Sift flour and spice, rub in butter, add sugar and fruit. Beat the egg, add milk and vanilla, and pour into dry ingredients; place in well-greased bar tin. Bake in moderate oven about 35 minutes. While still warm ice with two tablespoons icing sugar mixed with a little milk. Slice and spread with butter.

Oaten Girdle Cakes.

Four ounces medium oatmeal or rolled oats, 2 oz. wheatmeal, 2 oz. flour, ½ teaspoon baking soda, 1 teaspoon cream of tartar, ½ teaspoon salt, 1 oz. fat, milk to mix. Measure the dry ingredients into a basin and rub in the fat. Mix to a soft dough with milk and roll out ¼ in. thick. Cut in triangles and cook on a floured girdle or in a thick frying-pan.

Apple Turnovers.

Roll some short pastry out as thick as a florin, cut with round cutter, place some sliced apples in centre, sprinkle with sugar and a little spice, wet the edge and close over, wash over with milk, bake in a fairly warm oven for 20 minutes.

Cornish Pasties.

Half-pound beef skirt, ½ lb. potatoes, 1 onion, 4 oz. dripping, 1 teaspoon baking powder, 1 lb. flour, salt and pepper. Chop meat into small pieces. Peel, wash and mince potatoes. Peel and mince onion. Sift together into a bowl, flour, salt and baking powder. Rub in dripping and mix with cold water to a stiff paste. Turn pastry on to a lightly floured board. Roll out to a ¼ in. thickness and cut into 6 in. or 7 in. squares. Place a little of the mixture in the centre of each square. Season to taste with pepper, salt and onion. Fold the paste over the meat, joining it by pressing the edges together with thumb and finger. Bake on greased tins in a quick oven for 30 to 35 minutes.

Drop Scones.

Half pound plain flour, 1 teaspoon baking powder, pinch of salt, 1 egg, ½ pint milk, or milk and water. Sift the dry ingredients into a mixing bowl. Beat up the egg with a little of the milk. Pour into a well in the centre of the flour, stir the mixture, gradually adding the rest of the liquid. The batter should be fairly stiff. Beat the mixture with a wooden spoon. Place in spoonfuls on a hot, greased frying pan or hot plate. Brown one side, turn, and brown the other side. Spread with butter and serve very hot.

QUEENSLAND WEATHER IN AUGUST.

Seasonal prospects were considerably enhanced during August by a series of valuable rains which spread over the greater part of the State, giving relief to the dry central-west, central-interior and adjacent highlands. The additional falls in the south-west and Warrego further enhanced the already good prospects in those districts, a considerable contrast to the dry and drought conditions of the past few years. Parts of the central coast could do with more rain but over the great bulk of pastoral country bright early season prospects are being experienced. Although district aggregate rains in the dry farming districts of the Downs and South Coast were somewhat below normal, they came at an opportune time and have been followed by good soaking falls during the first three days of September, which ranged up to one and half to three inches on the Downs. These should greatly improve general farming and dairying prospects and strengthen anticipations of a heavy 7,000,000 to 8,000,000 bushel wheat yield. Showers with local moderate falls were recorded on the far north tropical coast during the first week of the month and there were some scattered and moderate rains in the Peninsula and Carpentaria on the 6th and 7th. During the week-end 9th to 11th, general good to heavy amounts were recorded in the sub-tropical interior, penetrating to parts of the Central Highlands and Upper West by the 12th. The best rains of the month commenced in the Upper West early in the week-end, 16th to 18th, and spread eastward and southward over the State till the 20th. Week-end totals in the Upper West, central interior and south-west contained many one and a half to over two inch registrations.

As shown in the rainfall table many inland areas received record or near record August totals.

Records.—

Laura	310	Muttaburra	301	
Palmerville	365	Tangorin	280	Ayrshire Downs, 232 highest since 233 in 1886
Cloncurry	298	Selwyn	308	Winton, 195 highest since 272 in 1886
Granada	123	Urandangie	248	
Aramac	267	Muckadilla	303	Boulia, 338 highest since 409 in 1886
Longreach	233	Quilpie	249	

Temperatures.—Average maximum temperatures in the tropical half of the State ranged from 0.5 deg. below at Cairns to 1.2 deg. above at Rockhampton. Minimum temperatures were generally above normal from 0.9 deg. at Thargomindah to 6.1 deg. at Mitchell and over 4 deg. in several districts. Stanthorpe recorded 40 deg. and under in the screen on 22 nights mainly between 1st to 7th, 12th to 17th, 22nd to 30th. Lowest minimum readings:—Tambo 29 deg. and 23 deg. (14th); Kingaroy 30 deg. and 25 deg. (15th); Bybera 29 deg. and 19 deg. (14th) (18 nights 30 deg. and under); Stanthorpe 25 deg. and 18 deg. (14th) (20 nights 30 deg. and under); Mitchell 31 deg. and 25 deg. (27th).

Fog Patches south coast 5th, 7th, 8th, 9th, 12th, 14th, 16th Palmerville; 28th Karumba; Downs, south coast, Central Highlands 13th; southern interior and Downs 18th and 19th.

Brisbane.—Pressure $\frac{9+3}{2}$ 30.091 inches (normal 30.093). *Temperature.*—Mean maximum 70.6 deg. (normal 71.3 deg.); mean minimum 51.5 deg. (normal 50.0 deg.); mean temperature 61.1 deg. (normal 60.7 deg.) Highest daily 78.0 deg on 6th. Lowest daily deg. 43.6 deg. on 28th. *Rainfall.*—50 points on 6 days; average 188 points on 7 days. *Sunshine.*—208.3 hours, 34.4 below normal. Maximum wind gust, westerly 40 m.p.h. on 24th. *Frost.*—Suburbs 1 on 26th. *General Fog.*—1 on 20th. Fog or mist patches 10.

Rain position is summarised below:—

Division.	Normal Mean.	Mean August. 1947.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	20	47	135 above
Peninsula South	7	285	3971 „
Lower Carpentaria	10	113	1030 „
Upper Carpentaria	25	37	48 „
North Coast Barron	114	436	282 „
North Coast Herbert	167	351	110 „
Central Coast East	77	134	74 „
Central Coast West	50	77	54 „
Central Highlands	84	177	111 „
Central Lowlands	48	263	448 „
Upper Western	16	183	1044 „
Lower Western	32	254	694 „
South Coast, Port Curtis	118	183	55 „
South Coast, Moreton	169	121	28 below
Darling Downs, East	131	94	28 below
Darling Downs, West	88	188	114 above
Maranoa	91	246	170 „
Warrego	75	199	165 „
Far South-West	49	213	334 „

Commonwealth of Australia, Meterological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

OCTOBER.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			Minutes Later than Brisbane at Other Places.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	5.29	5.47	Cairns	36	22	Longreach	38	31
6	5.23	5.49	Charleville ..	28	26	Quilpie	34	36
11	5.18	5.52	Cloncurry	55	45	Rockhampton ..	13	7
16	5.13	5.55	Cunnamulla ..	29	30	Roma	18	16
21	5.07	5.58	Dirranbandi ..	18	20	Townsville ..	30	19
26	5.03	6.01	Emerald	22	16	Winton	44	36
31	5.00	6.04	Hughenden ..	40	30	Warwick	3	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	p.m.	a.m.
1	6.43	6.03
2	7.41	6.35
3	8.43	7.09
4	9.47	7.48
5	10.53	8.32
6	11.57	9.23
7	..	10.20
	a.m.	
8	12.58	11.24
		p.m.
9	1.54	12.31
10	2.43	1.38
11	3.26	2.45
12	4.05	3.49
13	4.40	4.51
14	5.14	5.53
15	5.47	6.53
16	6.22	7.54
17	6.58	8.53
18	7.38	9.52
19	8.22	10.49
20	9.11	11.42
21	10.02	..
		a.m.
22	10.56	12.30
23	11.51	1.13
	p.m.	
24	12.46	1.52
25	1.42	2.28
26	2.37	3.00
27	3.33	3.31
28	4.30	4.02
29	5.29	4.33
30	6.31	5.07
31	7.36	5.45

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	17	19	33	36	8	10	37	41
6	9	30	25	44	0	20	26	53
11	13	24	29	40	3	15	32	46
16	24	13	41	28	16	3	47	32
21	30	10	46	24	21	0	53	27
26	23	14	39	30	14	5	44	34
31	13	25	28	41	2	19	31	49

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	25	31	47	51	32	36	21	26
3	14	41	39	58	24	44	13	35
5	6	50	35	63	20	49	6	42
7	3	55	34	67	18	52	4	45
9	6	50	35	63	20	49	6	42
11	15	40	40	58	25	43	14	34
13	26	30	47	50	32	35	22	25
15	37	18	55	43	40	27	31	17
17	46	9	62	36	47	22	38	9
19	53	4	67	33	50	19	44	5
21	55	4	68	33	51	19	45	5
23	51	6	65	34	49	20	42	7
25	42	13	58	39	43	24	35	13
27	32	24	52	46	36	31	26	21
29	21	34	44	54	29	39	18	29
31	11	44	38	60	23	46	10	37

Phases of the Moon.—Last Quarter, October 7th, 8.29 p.m.; New Moon, October 14th, 4.10 p.m., First Quarter, October 22nd, 11.11 a.m.; Full Moon, October 30th, 6.07 a.m.

On October 15th the Sun will rise and set 10 degrees south of true east and true west respectively, and on October 14th and 28th the Moon will rise and set almost at true east and true west respectively.

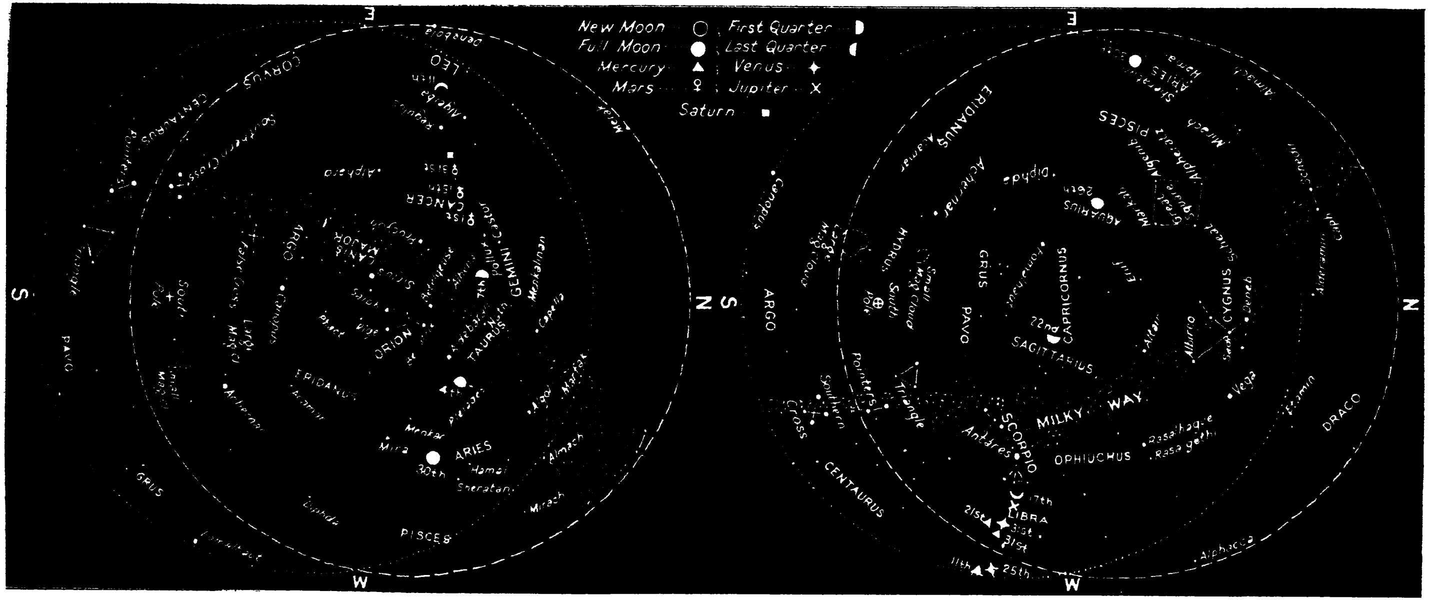
Mercury.—An evening planet all this month. On the 1st, in the constellation of Virgo, it will set 1 hour 40 minutes after the Sun. On October 13th it will reach its greatest angle east of the Sun and will then set 1 hour 55 minutes after sunset. At the end of the month, in the constellation of Libra, it will set 1 hour after the Sun. About the 21st it will be between Jupiter and Venus, but at the end of the month Venus will lie between Jupiter and Mercury.

Venus.—Too close in line with the Sun for observation at the beginning of October, but towards the end of the month may be seen low in the west during evening twilight. On the 29th it will pass about 3 degrees north of Mercury, and at the end of the month, in the constellation of Libra, will be lower in the sky than Jupiter and will set 1 hour 10 minutes after the Sun.

Mars.—At the beginning of the month will rise between 2 a.m. and 3 a.m., and at the end of the month will rise between 1 a.m. and 2 a.m.

Jupiter.—In October will be seen low in the west during evening twilight. At the beginning of the month will set between 9.30 p.m. and 10.30 p.m., and at the end of the month will set about 2 hours after the Sun.

Saturn.—Now a morning object in the constellation of Leo, will rise between 3 a.m. and 4.15 a.m. at the beginning of October and will rise between 1.15 a.m. and 2.30 a.m. at the end of the month.



Star Charts.—The chart on the right is for 7.15 p.m. in the South-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th October. (For every degree of Longitude we go west the time will increase 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the N.S.W. border. When facing North hold "N" at the bottom: when facing South hold "S" at the bottom and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another moving east to west arrive at any selected position about 4 minutes earlier each night. Thus at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th. and at the end of the month about one hour earlier than that time. The positions of the moon and planets which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

AUGUST RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.,	No. of years' records.	Aug., 1946.	Aug., 1947.
North Coast.	In.		In.	In.
Atherton	0·84	42	0·12	4·99
Cairns	1·65	61	0·13	4·94
Cardwell	1·22	71	0·12	3·11
Cooktown	1·17	67	0·33	5·36
Herberton	0·61	57	0·15	2·77
Ingham	1·44	51	0·03	1·41
Innisfail	4·85	62	0·29	9·39
Mossman	1·34	19	0·10	5·28
Townsville	0·50	72	Nil	3·25
Central Coast.				
Ayr	0·58	56	Nil	0·83
Bowen	0·72	72	Nil	0.22
Charters Towers	0·50	61	Nil	1·12
Mackay	1·09	72	Nil	1·57
Proserpine	1·45	40	Nil	2·10
St. Lawrence	0·79	72	Nil	3·43
Central Highlands.				
Clermont	0·70	72	0·03	1·17
Springsure	0·99	74	0·61	2·29
South Coast.				
Biggenden	1·04	44	0·35	0·96
Bundaberg	1·27	60	0·13	1·47
Brisbane Bureau	1·89	95	0·40	0·50
South Coast—contd.	In.		In.	In.
Caboolture	1·62	67	0·67	0·72
Childers	1·21	48	0·48	2·11
Crohamhurst	2·17	50	0·13	1·12
Esk	1·39	56	0·42	0·58
Gatton College	1·08	44	0·42	0·64
Gayndah	1·12	72	0·52	0·88
Gympie	1·65	73	0·50	2·12
Kilkivan	1·35	62	0·46	1·51
Maryborough	1·61	72	0·64	1·24
Nambour	1·88	47	0·04	1·43
Nanango	1·29	61	0·59	1·25
Rockhampton	0·82	72	0·01	2·26
Woodford	1·61	55	0·45	..
Darling Downs.				
Dalby	1·16	73	0·03	0·66
Emu Vale	1·06	47	0·30	0·42
Jimbour	1·10	64	0·20	0·49
Miles	1·08	58	0·07	1·29
Stanthorpe	1·73	70	0·30	0·90
Toowoomba	1·58	71	0·58	1·05
Warwick	1·40	78	0·05	0.66
Maranoa.				
Roma	0·86	69	Nil	2.40
St. George	0·91	62	Nil	3·52

CLIMATOLOGICAL DATA FOR AUGUST.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	79	66	83	13, 14, 15	54	26	494	13
Herberton	..	73	55	82	20	39	25, 26	277	11
Townsville	..	79	63	83	3, 14	48	27	325	5
Rockhampton	30·12	77	54	83	8, 13, 14, 15	41	26	226	4
Brisbane	30·14	71	52	78	6	44	28	50	6
Darling Downs.									
Dalby	..	69	43	79	15	32	15	66	5
Stanthorpe	..	61	37	71	6	25	14	90	7
Toowoomba	..	63	43	75	6	34	29	105	5
Mid-Interior.									
Georgetown	30·00	87	60	99	17	43	24	20	2
Longreach	30·18	78	49	91	8	32	13	233	4
Mitchell	30·15	69	45	79	6, 7	31	27	302	7
Western.									
Burketown	..	86	62	91	8, 12, 19	50	26, 27	16	1
Boulia	30·07	75	54	87	6, 28, 30	44	1, 24	338	5
Thargomindah	30·11	68	46	88	10	36	1	212	5

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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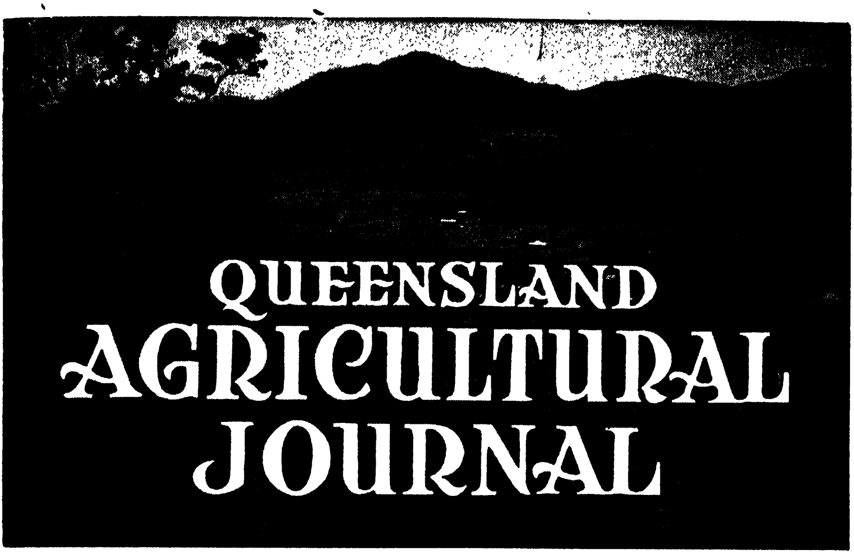
Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



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Event and Comment.

The Case for Fodder Conservation.

THE case for fodder conservation in Queensland has been put concisely, adequately, and in easily readable form in a departmental pamphlet which is now available for distribution to dairy farmers.

Long before the protracted dry season of 1946 a number of Queensland dairy farmers had proved to their own satisfaction that regular storage of stock feed paid them handsomely not only as a dry-time reserve, but for use during that period of the year when pastures are more or less dormant. As pointed out in the publication under review, supplementary feeding of dairy stock is not simply a device for saving stock from starvation. In districts where grazing is never adequate during the whole year, hand-feeding is a necessity if maximum production is to be obtained from a dairy herd. Consideration of some of the points made by farmers who believe in regularly conserving fodder will bring home to any doubter the wisdom of such a practice and its adoption in the ordinary farm routine.

Concrete examples are quoted as proof of the economy of conservation and its practical value, not only as an emergency stock food supply, but also in the maintenance of dairy production at a satisfactory level throughout the year. In the Pittsworth district production figures from several herds of 25 to 50 cows were examined. Herds fed during the dry months with sorghum silage, lucerne, or cereal hay as a base had

a butter-fat average of 220 lb. in 1946, while those not hand-fed but had some grazing on standover crops averaged only 170 lb. A farmer in the Oakey district set out to see how his cows responded to hand-feeding. From the beginning of April until late July he had only dry grass in his paddocks. His weekly factory pay fell from £14 in early April to £8 in mid-May. He then started hand-feeding. His next week's pay was £11, and as he increased the ration returns rose to £18 a week. Very little of the feed used by this farmer was home-grown, and chaff and concentrates were bought on a high market. His feed bill from May to July was £71, and his returns totalled £192. Undoubtedly his profit would have been greater had he had more home-grown fodder conserved. An interesting point is that by hand-feeding he was able to double his production at a time when factory output was, generally, very low. A neighbouring farmer fed crushed grain for four dry months (August-November, 1946) at a cost of 13s. 7d. per cow per month. His average return per cow per month was 45s., leaving him with a net profit of 31s. 5d. per cow per month. A typical case of a farmer in the same area who did not feed showed a return of only 19s. 9d. per cow per month for the four-month period.

Another case of three adjacent milk-producing farms in the Warwick district is cited. Two of the farmers who hand-fed largely with home-grown lucerne hay produced milk equivalent to nearly 300 lb. of butter-fat per cow. The third farmer did not feed and his average butter-fat was 145 lb. per cow.

An Allora-Clifton district survey showed that for four herds fed adequately on reserve fodders the production for the dry period, July-December, 1946, was only 7 per cent. less than that for the corresponding period in 1945, whereas combined factory production was down 35 per cent. For four typical non-feeding farms, production was down 50 per cent. If this figure is taken as the average drop in production for all farms not feeding supplementary fodders, net profit from feeding on farms on which costs were kept works out at from £13 to nearly £200 for farms of different sizes. To these profits should be added the benefit of maintaining stock in condition.

Similar surveys were made in other districts, and the evidence gathered was overwhelmingly in favour of supplementary feeding. The production of two milk-producing farms in the Samford district is worth quoting. Farm No. 1, on which there was no home-grown conserved fodder and insufficient purchased concentrates, averaged 250 gallons per cow. Farm No. 2, using silage and adequate bought fodder to make up a balanced ration, averaged 500 gallons per cow.

Other matters dealt with in this thought-provoking publication include the increasing of total annual production; the increasing of off-season output; improvement of quality in dairy produce; testing true production capacity of cows; keeping cows in condition; reducing production and manufacturing costs; the need for co-operation; availability of equipment for silo construction; financial assistance for fodder conservation and silo construction; balancing stock feed mixtures; grazing crops and improved pastures; and planting tables for fodder crops in dairying districts throughout Queensland. This publication, *The Case for Fodder Conservation,* of which copies are now being distributed, is obviously well worth studying by every Queensland dairy farmer.

Tractor Costs.*

C. G. STORY.

HAPHAZARD methods are of no use to the farmer who wishes to make his farming systematic and efficient. Since the modern farmer employs a number of mechanical units, each of which must contribute its quota towards maintaining the general efficiency of the property, costs of production are of vital concern to him because, when related to his gross returns, they decide to a large extent the profits earned. To obtain his livelihood returns must show a reasonable margin over costs.

A considerable amount of capital is invested in farm machinery of which, on most cane farms, the tractor forms an important part. This power unit has undoubted advantages on the farm, and, since it represents a fairly large outlay, it is both profitable and interesting for the farmer to know accurately how much it actually costs him to run his tractor for any period and also what it costs to do various cultivation operations with the tractor.

Tractor costing does not require any intricate accounting. It can be made simple and straightforward and any owner can readily compute the costs for his own particular unit and conditions. An almost essential adjunct to costing is a *tractor log* in which a daily record should be kept of the following items:—Consumption of fuel, oil, and grease; hours worked; area cultivated and type of work performed. Records of the costs of fuel, oil, and repairs, and dates when costs were incurred, should also be kept in the log.

The cost of running a tractor for any period can be calculated by adding the direct costs of fuel, oil, grease, repairs, and labour to the estimated indirect costs (interest and depreciation) over the same period. Dividing this total by the number of hours worked will give the total cost of the tractor per hour. It should be noted that to determine the overall cost per acre cultivated, an allowance must also be made for interest, depreciation and maintenance of implements used, as well as labour employed. This amount should be added to the previous total before dividing by the number of acres cultivated.

Two methods of tractor costing are suggested.

1. Costing on a daily basis. This method gives immediate information.

---

* From *The Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

2. Costing on an annual basis. This requires a record of all expenditure on the tractor for twelve months. Knowing the number of working days for the year, daily costs can then be computed.

METHOD 1.—DAILY COSTING.

(*Note*:—The figures used in the following table are only to illustrate the method. Each owner would, of course, substitute his own particular figures.)

Indirect Costs.

	£	*s.*	*d.*
Interest.			
Value of tractor, £500.			
Interest allowed, 4 per cent. per annum.			
Interest for the year, £20.			
Allowing 100 working days per year, the interest per working day is	0	4	0
Depreciation.			
Assumed tractor life, 6,000 working hours.			
Equivalent number of 8-hour days = 750.			
Depreciation per working day = 500 ÷ 750	0	13	4
Total indirect cost per day	0	17	4

Direct Costs.

	£	*s.*	*d.*
Maintenance.			
Allowing 3 per cent. per annum for tyres and repairs, cost for year of 100 working days would be £15; so that maintenance per working day is	0	3	0
Fuel.			
Petrol per day	0	1	3
Power kerosene, 8 gals. per day at 1/6⅜ per gal.	0	12	3

Crankcase Oil.

	£	s.	d.
2 gals. S.A.E. 40 every 120 hrs. at 8s. 3d. per gal. ..	0	16	6
1 filter element every 120 hrs. at 9s. 9d. each	0	9	9
Total	£1	6	3

	£	*s.*	*d.*
120 hours is equivalent to 15 days, therefore daily cost is ..	0	1	9
Differential and Transmission Oil.			
5 gals. per 100 days at 8s. per gallon equals 40s. per 100 days, therefore daily cost is	0	0	5
Grease.			
10 lb. per 100 days at 10d. per lb. equals 100 pence per 100 working days, therefore daily cost is	0	0	1
Labour.			
Allow £1 per day	1	0	0
Total direct cost per day	1	18	9

Total tractor cost.

	£	*s.*	*d.*
Indirect costs per working day	0	17	4
Direct costs per working day	1	18	9
Total cost per working day of eight hours	£2	16	1

METHOD 2.—ANNUAL COSTING.

Indirect Costs.

	£ s. d.
Cost price of tractor..........	
Estimated depreciation at .... per cent.	
Estimated interest at .... per cent.	

Direct Costs.

Total fuel	
Total oil and grease	
Total maintenance tyres and repairs	
Total labour	
Total cost per year	£

Daily cost is total annual cost divided by number of working days per year.

SCHEDULE OF CULTIVATION COSTS.

Total tractor cost per day of eight hours is..........	
Area cultivated per day is .... acres.	
Tractor cost per acre is	
Estimated cost per acre to cover interest, depreciation, and maintenance of implements used is	
Cost of labour per acre for cultivation	
Total cost of cultivation per acre	£

Depreciation is calculated on anticipated length of life. If 15 per cent. per annum were allowed for depreciation then a life of approximately seven years would be expected. If the tractor lasted longer than this, then depreciation costs would be reduced to nil; repair costs after seven years, however, would tend to increase. On the average, interest may be calculated with safety on 75 per cent. of the original cost because over a number of years the interest costs would decrease due to the depreciated value of the tractor. Moreover, a certain amount should be banked each year to cover depreciation, thereby reducing the "overdraft" on which interest must be paid. In general, indirect costs will vary with the interest and depreciation allowed on the tractor for the period under consideration and with the number of days or hours worked per year. Direct costs will vary with the type of tractor and skill in its operation as well as the mechanical knowledge of the driver. Good tractor management depends upon conscientious daily maintenance, prompt attention to repairs, careful driving, and the avoidance of excessive strain on the machine.

The adoption of low fuel consumption tractors with power lifts and attachable implements enables large areas to be cultivated at low cost and work to be performed rapidly and efficiently at the period when it is required. Where large areas are concerned and greater power is required the crawler tractor has its supporters. In all cases, however, the working cost of these machines plays an important part in the costs of production on the property.

Irrigation Spears of the Bundaberg District.*

S. O. SKINNER.

DURING recent years, the value of irrigation has impressed itself firmly in the minds of canegrowers in the Bundaberg district. Many growers, previously without irrigation facilities, have made strenuous efforts to locate underground water supplies and to pump the water from drifts which, in many cases, have proved difficult to manage.

In general, many of the underground drifts contain a fair percentage of fine sand and a smaller amount of clay particles. These are known as tight drifts and often present a problem in obtaining a free supply of water. In these drifts, the main type of spear used in earlier years was often found to clog.

It is therefore interesting to describe the various types of spears in use, particularly that known as the "Bag Spear" which is believed to be peculiar to this district.

The Bundaberg underground formations do not lend themselves to driving, hence the pointed spear which is designed for this purpose is little used and is mainly limited to small installations set up in places such as dry sandy creek beds.

Earlier Main Type.—This consists normally of a 4 to 6-inch casing drilled with ¾-inch holes placed at approximately 1½ inches apart from centre to centre or (as shown in Fig. 106 (*a*)), with holes in staggered rows, placed 1½ inches apart between centres around the spear and 2 inches apart along the length of the spear. A non-drilled area of approximately 3 inches is usually left at the bottom, and the open end of the spear is sealed with a welded plate.

Around the outside of the casing is spirally wound ⅛ to ¼-inch diameter wire with approximately 2 inches between turns, as shown in Fig. 106 (*a*). Over this is placed sheet or wire gauze.

The action of the spear is a direct suction of water through the gauze, through the drilled holes and up through the casing.

This type of spear is still in use, particularly in early installations where they have proved satisfactory, and in new installations where the drift is open. Its chief advantages are its free and direct intake of water through the holes in suitable drifts, and secondly it enables the use of the maximum sized spear casing in a given sized bore hole, as against the bag spear type which will be described presently.

The chief disadvantage is that of clogging in tight drifts. In fine sand and clay a gradual clogging up occurs between the gauze and the metal of the spear between the holes, aggravated by a pocketing effect from the spirally wound wire. This eventually reduces the effective area of the gauze to that immediately opposite the holes only, and with any external clogging of the gauze itself at these points, the efficiency of the spear is further reduced.

Bag Spear.—The clogging of the former spear led to efforts to design a spear which would allow the inflow of water to be evenly distributed and maintained over the whole gauze surface, and furthermore

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* From *The Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

would eliminate any impediment to flow that would otherwise promote siltation between gauze and spear casing. A leading Millaquin grower is credited with devising what is commonly termed the bag spear, which is the type most widely adopted now.

This spear consists of a 4 to 6 inch diameter casing, on the outside of which are welded four to six ribs, formed of $\frac{3}{4}$ by $\frac{1}{4}$-inch or 1 inch by $\frac{1}{4}$-inch steel on their edges. These ribs are up to some 12 feet in length and extend usually from 9 to 18 inches beyond one end of the casing. On the bottom of these extended ends is welded a steel plate. This forms the bottom end of the spear.

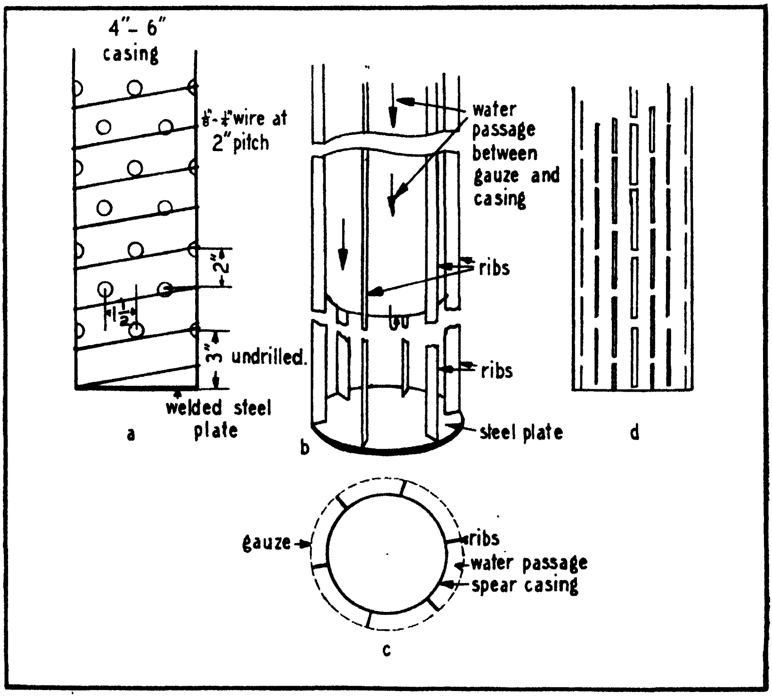


Plate 91.

(*a*) Earlier main type of irrigation spear used at Bundaberg for pumping from underground water supplies; (*b*) showing ribs in relation to the casing in the bag spear; (*c*) a cross sectional view of the bag spear; (*d*) type of irrigation spear used without gauze showing staggering of longitudinal slots around casing.

Over the full length of the ribs is placed sheet or wire gauze. At the top of the ribs the gauze is tapered in so that it can be attached firmly to the casing, usually by the aid of a collar. The gauze is spot soldered down the ribs and firmly soldered at all joins. Fig. 106 (*b*) shows the ribs in relation to the casing, and Fig. 106 (*c*) is a cross-sectional view. Fig. 107 shows the completed spear with gauze fitted.

In operation, the water passes in through the full length of the gauze and falls vertically down to the open end of the casing. Since the channel-way between the gauze and the casing is in the vicinity of $\frac{3}{8}$ inch according to the width of ribs used, it cannot become clogged

with any fine sand and clay that passes in through the gauze. This material falls to the bottom of the bag where the turbulence of water in changing its direction is so great, that it passes up with the water to the pump outlet and does not clog.

The length of bag projecting beyond the casing is important. If made over 2 feet with a 6-inch diameter casing, silting in the bottom of the bag has been found to occur. If made under 9 inches with a 4-inch casing, it is believed that the abovementioned turbulance is so great that a restriction is placed on the desired free intake of water.

Plate 92.

Two Completed Bag Spears with Gauze Welded in Position.

The size of the steel plate at the bottom is often made slightly larger than the circumference of the ribs so that in the event of "pulling" the spear, the possibility of leaving the gauze behind is minimised.

The advantages of this spear are firstly, the prevention of clogging, and secondly, the presentation of a much larger surface of gauze in relation to the size of the spear casing. Against this, however, is the disadvantage of requiring a larger, more expensive, bore hole and temporary bore hole casing to place the spear down.

Modifications of the bag spear which are employed, mainly refer to the spear casing within the gauzed area which may be drilled with a limited number of holes of up to 1 inch in diameter. This, while tending to defeat the true function of the bag, would on the other hand, in suitably graded drifts, give a freer intake of water.

Spears Without Gauze.—These spears consist simply of a perforated casing. The casing varies from 4 to 6 inches in diameter and the perforations from drilled circular holes to long narrow slits cut by an oxy-acetylene torch. In a typical drilled type, holes are of $\frac{1}{4}$ inch

diameter at ½ inch centres over a length of 20 feet, with the bottom end of the spear sealed with a welded plate. This particular spear in a good open drift has given excellent results.

With the oxy cut type, slots range in the vicinity of 3-16th inch wide by 4 inches long with ¾ inch between slots, and with the slots staggered as in Fig. 106 (*d*).

Of the two types of perforation used the slot is believed to possess the advantage of being less subject to clogging. This is based on the assumption that sand and gravel usually approximate a round shape and thus can more readily completely fill and choke a round hole. To fill the slot, however, several pebbles or large grains of sand are required, but in that case there are always some gaps left through which water can pass.

Type of Gauze Used.—As is readily appreciated, type of gauze plays a major role in the efficient functioning of any type of gauzed spear, The three main types used are firstly, copper sheet gauze with slotted holes; secondly, copper sheet gauze with round holes; and thirdly, brass wire woven gauze.

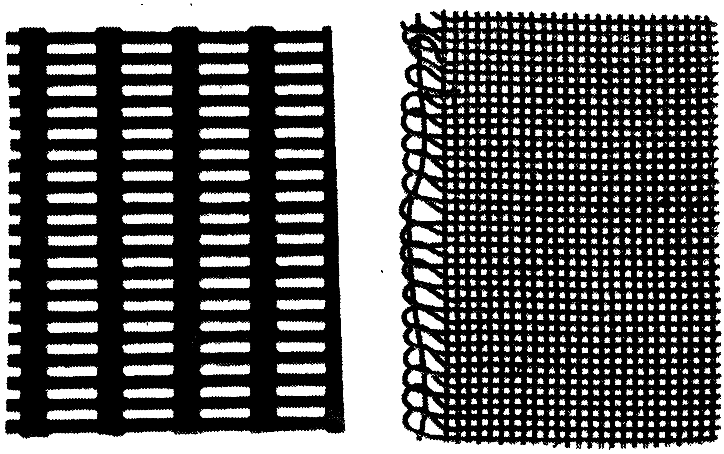


Plate 93.
SAMPLES OF SLOTTED GAUZE AND WOVEN WIRE GAUZE. (Approximately three-quarters normal size.)

Of the three, the former type appears to be the most widely sought, and in appearance is as shown in Fig. 108. The preference for slotted gauze over round holes is based on the advantages of slotted versus round holes against clogging as indicated earlier. The woven wire gauze shown in Fig. 108, while not extensively used in the past, varies greatly in size of weave from 25 to 144 holes per square inch.

The selection of gauze, however, still remains largely one of individual preference with little comparative data as a guide, and is limited at present to that which is procurable. General opinion, however, appears to be directed to the use of larger perforations that will allow a considerable percentage of sand to pass for the good development

of the spear site. There is room for thought in the findings of an overseas firm which appears to have done much work on underground supplies, that, although in the past it was considered good practice to select a size of slot that would exclude 60 per cent. to 80 per cent. of the sand, better results can be obtained with larger slots that will pass up to 60 per cent., and in some cases up to 80 per cent., except where the sand is of high uniformity.

Wallaby Control.*

F. W. READING.

THE destruction caused to cane crops by wallabies has given the Lower Burdekin Cane Pest and Disease Control Board and myself, in the capacity of the Boards' Supervisor, much food for thought. Many and varied efforts have been made to control these pests but such efforts have not met with unqualified success.

Climatic conditions in the Burdekin area, with its wet season of short duration followed by a comparatively dry winter and spring, tend to encourage the wallaby to feed on young irrigated cane after natural grasses have lost their succulent growth.

Damage to young autumn plant cane becomes apparent during the dry winter months when many tops may be eaten off. This is not considered to be very detrimental since the removal of the primary shoot normally promotes better stooling, but in many cases the plant is completely removed from the ground and complete loss of the stool results. With dry conditions continuing into the spring, damage to older cane takes the form of broken sticks, only the growing points of which are chewed. Quite large areas in a field may be affected in a short time though the damage may not be apparent from the headland.

A fair measure of control in pre-war years was exercised by organized shooting when the value of skins and scalp bonuses induced quite a number of people to take part. The attraction of the sporting aspect was also not inconsiderable.

Wartime restrictions on guns and scarcity of ammunition allowed the pest to multiply and penetrate to uncultivated lands within the area, where the growth of long, coarse grass and weeds afforded excellent cover. Burning off harbourage for the pest is not always practicable during the harvesting season, since uncontrollable fires may cause extensive damage to canefields.

Poisoned baits and snares have been found to be ineffective since treated areas seem to be avoided by the wallabies. Strychnine and arsenic, applied both dry and in solution to young cane shoots, green corn cobs, bran and pollard balls, sweet potato, pineapple, bananas,

* Paper submitted to the Pest Boards Conference held at Tully, 29th August, 1946.

Reprinted from *The Cane Growers' Quarterly* for April, 1947 (Bur. Sug. Expt. Stns., Dept. Ag. & Stk., Q.).

cabbage leaves, and sliced pumpkins, gave no noticeable results. Moreover, the use of poisons is not favoured by farmers because of the risk to children and farm animals.

Although the electric fencer has been suggested as a possible means of control, it is believed that it has not been used in this district.

Dogs have been used to check the activities of wallabies in the Burdekin, as well as in most other parts of Queensland. Practically every cane farmer keeps dogs of one type or another, but very few have dogs of a recognized hunting breed. The hunting breeds differ from the common farm dog in their method of working, in that a hunter will follow a scent for a considerable distance and for some time. On the other hand, non-hunting breeds will generally act only when they have the animal in sight and rarely operate beyond the boundaries of the farm.

Plate 94.
BEAGLE HOUND, FINE HAIRED TYPE.

The Beagle hound was introduced into the Ayr district in 1944 in an attempt to control the wallaby pest, and now there are twelve operating in the cane area. The Beagle is a true hound, and has been a recognized breed for at least 200 years. It is not as well known as most sporting dogs, because it is not widely exhibited as a show dog, and, as far as is known at present, is being used mostly in the southern States for hare trapping, where it is considered to exercise a partial control of this pest.

In their working habits they seem to leave the house at 3 to 5 a.m. and return at 9 to 10 a.m., except when on a long scent in which case they have been known to remain away for two or three days. Their radius of action is usually not great, although at times the Beagle has been noticed working up to five miles away from the home. It is not known how long they will run without resting, but their endurance when on a trail through the cane paddocks, grass and weeds, and in open country is superior to most farm dogs. However, since the Beagle

is a rather small dog it is desirable that it should work in company with other dogs, for when the Beagle finds the pest the larger dog ensures the killing. Alone, the Beagle may not effect a kill, but by disturbing the wallabies persistently in the early hours of the morning, when they seem to feed, damage to crops will be reduced, and the pest may be forced to migrate to pastoral areas where it is less likely to be molested by dogs.

As the wallabies are checked in a locality, the radius of effective action for the number of dogs at present in the Burdekin may become too great. Therefore, it is hoped that additional Beagle hounds will be introduced to drive the pest entirely from the cane area.

There are two types of Beagle hound, both of which are working in this area. Firstly, a type with fine hair, 14 in. to 16 in. in height, and 25 to 30 lb. in weight (Fig. 109) ; secondly, a dog with coarse hair, much like the Bassett hound, 16 in. to 19 in. in height, and 35 to 40 lb. in weight (Fig. 110). Colours in these types vary, including black and tan, white and pie, or lemon.

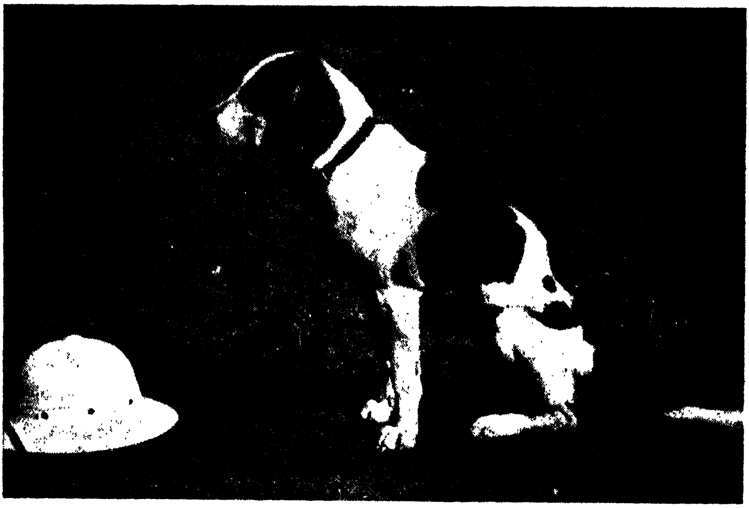


Plate 95.

BEAGLE HOUND, COARSE HAIRED, LARGER TYPE.

The Beagle hound commences working when eight to ten months old, and appears to require no special training. When the dog returns from the hunt, it may be a good practice to feed regularly with some prepared food, for this may reduce scavenging habits. As far as is known, they are not vicious towards man or child. Their stamina appears equal to the rough conditions of the work performed. Distemper and secondary distemper can be successfully treated with vaccine injections, as also can tick paralysis, but dog owners in tick infested areas already know the value of daily examinations for the presence of the dog tick.

PLANT PROTECTION

Experiment on the Control of Bacterial Spot of Plums.

R. B. MORWOOD, Pathologist, Science Branch.

IN 1930, bacterial spot, *Xanthomonas pruni* EFS was recorded on plums in the Stanthorpe district. It is also known in New South Wales as well as many other parts of the world. The disease in this State produces a fruit spot, leaf spot, shot hole, and twig canker of plums. Only a limited number of varieties of plum are affected, and the disease has not been found on other stone fruit. Elsewhere it has been reported on peach, apricot, nectarine, and cherry. Orchard observations indicate that the October Purple variety is the most susceptible. This is followed by Santa Rosa, Doris, Beauty, Burbank, and Shiro in descending order of susceptibility. It has not been seen on Wilson nor on English varieties of plum.

Zinc-Lime Spray Trials.

In the years 1932 to 1937 a considerable number of orchard experiments were carried out for the purpose of establishing control methods for bacterial spot. Promising results had been obtained in America on peach bacterial spot with nitrogenous fertilizers and with a zinc-lime spray. These were, therefore, the basis for the first year's work. However, neither treatment adequately controlled the disease, and heavy infections on nitrate-treated trees led to the dropping of this treatment after the first year. The zinc-lime spray trials were persisted with for three seasons with varying results, the spray used being prepared from 4 lb. of zinc sulphate and 4 lb. of hydrated lime to 40 gallons of water. It was finally concluded that zinc-lime was useless.

1935 Season. Exploratory Fungicide Trial.

The next trial was exploratory, using five different spray treatments. The sprays were applied to single trees in four randomised blocks. Block 4 was incorrectly sprayed and was not used in computing results. Details of the sprays and methods of use are given in the following table:—

——	Prior to Blossoming 4th September.	After Petal Fall 1st October.	One Month Later.	Two Months Later.
Bordeaux mixture	6–4–40	3–2–40*	..	..
Home-made cuprous oxide ..	1–10	1–20	..	..
Lime sulphur	1–15	1–60*	1–120*	1–120*
Colloidal sulphur	4 lb. per. 100 gals.	2–100	2–100	2–100
Shirlan	10 lb. per 100 gals.	5–100	2–100	2–100
Unsprayed	..	..	..	..

* Agral II. added at rate of 1 lb. per 100 gallons.

Results—

Both the copper sprays (Bordeaux mixture and home-made cuprous oxide) resulted in severe leaf fall when applied after petal fall. They were consequently not used on the later applications.

As the fruit ripened it was evident that the trees receiving copper sprays carried considerably less disease than those getting no copper. The counts of infected fruit at harvest are given below:—

PERCENTAGE OF FRUIT AFFECTED IN 1935 EXPERIMENT.

——	Block I.	Block II.	Block III.	Average.
Bordeaux mixture	0·2	0·6	6·6	2·5
Home-made cuprous oxide ..	0·8	1·6	0	0·8
Colloidal sulphur	3·4	2·1	47·5	17·7
Unsprayed	3·0	2·6	42·4	16
Shirlan	13·1	3·8	27·4	14·7
Lime sulphur	5·6	20·4	100	42

It was evident that copper sprays would exercise a controlling influence on the disease, and subsequent work was directed to the further testing of these fungicides.

1936 Season. Trial of Bordeaux Mixture Schedules.

The 1936 season's work was designed to test Bordeaux mixture applications in various schedules to find a method by which this spray would be effective and at the same time avoid the spray injury noted previously. Seven different spray schedules were tested in a block of 56 Doris plum trees. Unfortunately, frost interfered with the fruit setting, and no results could be obtained from the block.

At the same time a smaller trial was continued on the 12 trees which had constituted blocks I. and II. of the experiment which had given results in the previous year. These trees were divided into four blocks. Only one spray was used, and it was applied to two of the three trees in each block. The spray was Bordeaux mixture at the 6–4–40 strength in the dormant and budburst stages and 3–2–40 at the preblossom stage. The third tree in each block remained unsprayed. Results are given in the accompanying table:—

PERCENTAGE OF FRUIT AFFECTED IN 1936 EXPERIMENT.

——	Block I.	Block II.	Block III.	Block IV.	Average.
Unsprayed	29·4	18·7†	30·8	8·3	21·8
Sprayed	4·2	3·0	2·4*†	0·0†	2·1
	2·7†	0·3*	1·3	2·1	

* Received extra spray of Bordeaux mixture 1½-4-40 after fruit set.
† Had been sprayed with copper sprays in the previous season.

This trial confirmed the value of Bordeaux mixture in the control of the disease but did not test out alternative schedules. However, good results were obtained by using the three-spray schedule, and this has since been adopted as the standard recommendation for severely affected trees.

1937 Season. Final Bordeaux Mixture Trials.

In the following season a further attempt was made to get detailed information on spray schedules. Three separate experiments were made, the first on slightly infected Doris plums, a second on old and heavily diseased October Purple and Santa Rosa plums, and a third on the 12-tree block on which results had been obtained in the previous two seasons.

The first and largest of these, a repetition of the main experiment of the previous season, again gave no results, as the infection on most of the trees was negligible.

In the second experiment the fruit set on the old trees was poor and irregular, and the experiment designed to test the effect of various combinations of one, two, or three sprays was somewhat inconclusive. All that could be stated was that, with the trees which received the standard three-spray schedule, the amount of spot (8 per cent.) was reasonable considering the state of the trees. Those receiving only one spray averaged 30 per cent. spot.

In the third experiment a two-spray schedule was tested in the 12-tree block. Control was not as good as in the previous season, when three sprays were applied. The two sprays were Bordeaux mixture (6-4-40) at budburst and the same material at the 3-2-40 strength at the preblossom stage. Results are given below:—

PERCENTAGE OF FRUIT AFFECTED IN THIRD EXPERIMENT OF 1937.

——	Block I.	Block II.	Block III.	Block IV.	Average.
Unsprayed	32	48	22	19	30
Sprayed	10	27	8	3	12
	16	18	6	11	

The table indicates the variation in percentage infection of bacterial spot on different trees as well as the control exercised by Bordeaux mixture.

General Discussion and Recommendations.

The series of experiments was disappointing from the point of view of clear-cut conclusions on the finer points of spray control. However, there was built up a considerable body of evidence to indicate that adequate use of copper sprays in the period between bud movement and blossoming would effect the desired result. In the later years of the work, the information available was disseminated to orchardists, and many adopted the use of copper sprays. Observations soon became available to support the experimental evidence that Bordeaux mixture or an efficient substitute spray controlled the disease.

From a consideration of the results of the experiments and of orchard experience the following schedule has been recommended for application to varieties of plum susceptible to bacterial spot:—

(*a*) At bud movement, Bordeaux mixture, 6–4–40.

(*b*) Seven to ten days later, Bordeaux mixture, 6–4–40.

(*c*) Just prior to full blossom (about three weeks after the first application), Bordeaux mixture, 3–2–40.

9

If the disease has not been allowed to gain a serious hold on the tree the number of sprays may be reduced to two by omitting the second of these applications. Other copper spray materials may be used provided they disperse and adhere well and provided the prepared spray contains copper equivalent to that in the appropriate Bordeaux mixture. The non-copper sprays tried do not control the disease.

Acknowledgements.

Grateful appreciation is expressed for the helpful co-operation of orchardists who made the experiments possible, particularly Messrs. A. Philip, H. Dempster, and Ellwood Bros.

Protection of Harvested Potatoes from Tuber Moth Attack.

R. C. CANNON, Entomologist.

IN all potato-growing areas of the State, wastage occurs each season through the activities of the potato tuber moth.* In the growing crop, the larvae of this insect mine in the haulms and may cause some reduction in yield when growth is retarded due to drought or similar causes. However, in irrigated crops, or in non-irrigated crops enjoying favourable weather conditions, the reduction in yield is usually slight and of minor importance. The most severe losses are invariably the outcome of tuber infestation just before, during, or immediately after harvesting.

In the earlier stages of growth, when the haulms are green and succulent, larvae of the tuber moth usually restrict their activities to the above-ground parts of the plant. When the haulms commence to die off with the approach of maturity the insects attack the tubers themselves. Late hilling is recommended as a means of mitigating such losses, and, provided a cover of at least 4 inches of soil is placed over the maturing tubers, a fairly effective mechanical barrier is afforded against the entry of the pest. Emphasis must be placed on the lateness of the hilling, an operation which need not be performed till three to four weeks prior to maturity. Many growers commence to hill their crops too early, with the result that insufficient soil remains in the inter-row furrow for the effective construction of the final hill. Tubers surrounded by moist soil are less subject to attack than those in dry soil, and late watering may be an additional safeguard.

Despite these precautions, some tuber infestation may occur due to the inevitable imperfections of cultural practices and to soil irregularities. At night, moths may lay their eggs on any tubers which are exposed on the surface of the ground or accessible through soil cracks. Unhatched eggs or newly-hatched larvae present in the eyes would escape detection when the tubers are picked up after digging.

During harvesting, tubers are exposed on the surface of the ground for a time before being picked up, though it should be the aim to reduce

* *Gnorimoschema operculella* Zell.

this period of exposure to a minimum. The operation of digging will have dislodged larvae from the haulms and some of these will make their way to the tubers. Many of them would escape notice when the tubers are being harvested, no matter how carefully they might be examined.

Several dusts are available which will destroy exposed larvae present on tubers and prevent further infestation. The application of a protective dust at harvesting is therefore a worthwhile precaution. There are three dusts at present on the market which may be recommended for this purpose, namely, derris, D.D.T., and magnesite.

Derris is available as a dust containing 0.5 per cent. or more of rotenone, and acts mainly as a contact insecticide, and is non-toxic to human beings. In recent trials, commercial tubers were treated with derris dust and stored in northern Queensland for a period of 14 weeks during the summer months with a loss of only 0.5 per cent. due to tuber moth. Untreated tubers in the experiment were completely destroyed by the pest. In southern Queensland they have been kept in excellent condition for an even longer period.

If D.D.T. is to be used, a dust containing 2 per cent. of the para para isomer is recommended. There has been some diffidence in recommending D.D.T. for treating table potatoes on account of the lack of information on its effect on the consumer. Recently, however, it has been shown that only negligible amounts of the insecticide remain after cooking, and, since potatoes are invariably cooked, there can be no objection to using D.D.T. on stored table potatoes.

Magnesite is quite harmless to human beings, but acts rather differently and is somewhat less effective under conditions of high humidity. In the above-mentioned trial, magnesite-treated tubers were stored for the fourteen weeks with a loss of 2·5 per cent. due to tuber moth.

For the best results the potatoes should be treated at harvesting, either in the field or in the grading shed. For effective control it is necessary that the tubers be completely covered by a protective film of the dust. About ½ lb. of dust per bag, or 8 lb. per ton, is sufficient for the purpose. In order to obtain satisfactory results with such a small quantity, however, the dust must be applied efficiently or an inadequate cover will result.

There are two methods of application to be recommended, depending on whether the operation is to be carried out in the field or in a grading shed:

(*a*) *Field Method.*—In some areas, it is the regular practice to grade and fill the bags in the field, kerosene tins being used to gather potatoes in the rows. About an ounce of the dust should be thrown into the bottom of the empty tin. When filled with potatoes the contents of the tin are emptied into the bag and the dust swirls amongst the tubers leaving a fine film on the surface of each. After the bag has been filled a few more ounces of dust should be sprinkled on the top so that it may work its way down amongst the contents. The subsequent handling of the bags will serve to further distribute the dust within. It must be emphasized that with this method, each tinful of tubers must have its quota of dust.

(*b*) *Grading Shed Method.*—If the potatoes are taken into a shed for grading, the dusting can be carried out on a sloping bench. This should be about 8 feet long with a fall of about 6 inches and be provided with suitable sides converging at the bottom end to feed the tubers into the bags. The surface of the bench should be covered with a layer of the dust about one-eighth of an inch thick. The tubers may then be fed on to the higher end of the bench and worked down by hand to the bag, thereby collecting a film of dust. The dust layer on the bench would have to be supplemented from time to time by further additions of the insecticide as required.

On the basis of trials so far carried out there is little difference in the efficiency of magnesite, derris, and D.D.T. if the potatoes are to be stored during relatively dry periods of the year and the choice is made solely on a cost basis. If the storage period is likely to extend into a humid period, as, for example, the summer months, either derris or D.D.T. dusts are to be preferred.

The overall cost of treatment is so low in comparison with the benefits to be derived therefrom that the use of one or other of these dusts should be adopted as routine farm practice.

TREES AND SOIL CONSERVATION.

Many landholders will surround their homesteads with trees to protect them from wind, but the same landowners thoughtlessly destroy timber belts on their properties and completely overlook the fact that the timber belts protect the paddocks from the sweeping winds that pick up the valuable surface soil and carry it away.

In most grazing properties "scalded areas" of varying sizes are to be found. If some obstruction can be placed on these areas to hold the water and wind-blown soil and seeds, it will be found that they quickly begin to build up again. It has been observed where trees have been lopped for drought feed on scalded patches that the grass has built up again in six months under the dead branches when the patch has been devoid of all grass for many years.

On large scalded patches where cropping is not practical, simply ploughing strips across, ½ chain apart, and then ploughing similar strips at right angles will prevent the patches spreading further and building up commences by the arresting of wind-blown soil and seed.

On cultivation lands in the western areas smooth surfaces must not be left if wind erosion is to be prevented. Cases have been seen where oats, sown for grazing, have been fed out bare in the early summer, and then, because of pressure of work, the land has simply been left trampled smooth and devoid of cover. Such an area is quickly affected by the wind, sometimes to the extent that the soil commences to "creep." While working of the whole area is desirable, wind erosion can definitely be controlled, if not stopped altogether, on such lands by simply cultivating strips across the paddock one width of a scarifier wide and spaced 1 chain apart.

Hand Feeding of Stud Sheep.

G. R. MOULE, Veterinary Officer, Sheep and Wool Branch.

1. *Composition and Utilisation of Foodstuffs*—
    - Carbohydrates.
    - Fats.
    - Proteins.
    - Minerals.
    - Vitamins.
    - Water.
    - Dry matter.
    - Fibre.

2. *Foodstuffs Available in Queensland*—
    - (i.) *Roughages*—
        - Cereal hay or chaff.
        - Lucerne hay or chaff.
    - (ii.) *Concentrates*—
        - (*a*) *Energy-rich concentrates*—
            - Maize.
            - Oats.
            - Wheat.
            - Grain Sorghum.
        - (*b*) *Protein-rich concentrates*—
            - Linseed oil meal.
            - Cottonseed meal.
            - Meatmeal or Meat and bone meal.
            - Blood meal.
        - (*c*) *Cereal by-products*—
            - Bran.
            - Pollard.
    - (iii.) *Mineral Supplements*—
        - Sterilised bone meal.
        - Dicalcic phosphate.
        - Ground limestone.

3. *Importance of Nutritional Balance*—
    - Balance.
    - Overfeeding.
    - Underfeeding.

4. *Some Effects of Different Nutritional Levels*—

5. *Feeding Standards*—
   - (i.) Their value in sheep feeding.
   - (ii.) The maintenance and production requirements of sheep.
   - (iii.) Special production requirements—
     - (*a*) Growth and fattening.
     - (*b*) Pregnancy.
     - (*c*) Lactation.
     - (*d*) Semen production.

6. *Calculating Rations.*

7. *Diseases Associated with Faulty Feeding of Stud Sheep*—
   - (i.) Calculi or Bladder Stones.
   - (ii.) Pregnancy toxaemia or Twin-lamb disease.
   - (iii.) Milk fever or Hypocalcaemia.
   - (iv.) Bloat and Meal sickness
   - (v.) Prussic acid poisoning.

Most wool growers recognise the truth of the old saying "Half the breeding goes down the throat," but stud masters like to add the qualifying phrase "provided you have the blood to start with." No animal can develop the characteristics it has inherited unless it is properly fed. On the other hand, no amount of feeding will make an animal develop desirable characters which are not included in its inheritance, though skilled feeding may mask the effects of inheritance.

During recent years rapid advances have been made in the science of animal nutrition, and the purpose of this article is to present the available information which has immediate application in the feeding of stud sheep. In its preparation information has been drawn from overseas sources, as well as from the Council for Scientific and Industrial Research, and in particular from material collated by Dr. M. C. Franklin. His assistance, and that of Dr. M. White, of the Department of Agriculture and Stock, is acknowledged with appreciation.

COMPOSITION AND UTILIZATION OF FOODSTUFFS.

All foodstuffs are made up of varying proportions of carbohydrates, fats, proteins, minerals, vitamins and water. Differences in the types of carbohydrates, fats, proteins, minerals, and vitamins also occur. Each group of substances performs specific functions in the animal body. Correct feeding is based on a knowledge of these functions.

Carbohydrates.

Carbohydrates are composed of carbon, hydrogen and oxygen. The best known carbohydrates are sugar and starch; and the foodstuffs used in stud sheep feeding which are richest in carbohydrates are maize, grain sorghums, wheat and oats.

Fats.

Fats also are composed of carbon, hydrogen and oxygen, though their proportions and the way in which they are arranged differs from that of the carbohydrates. Carbohydrates and fats are fitted for the energy changes which take place within the animal body as they are

readily combustible. They are the chief "fuel" it consumes. They are largely interchangeable in this process of combustion, fat having about 2¼ times the heat value of an equivalent weight of carbohydrate. Linseed meal, cotton seed meal and meatmeal are all fairly rich in fats.

Proteins.

Proteins constitute a much more complicated group of substances than the carbohydrates and the fats. Besides carbon, hydrogen and oxygen they contain nitrogen and often such elements as sulphur, phosphorus and iron. Minute quantities of other elements are present in specific proteins. Like fats and carbohydrates, proteins can be burnt as fuel, but they have other more essential roles which they alone can perform. The minute cells, of which the living body is composed, are made up largely of proteins. Herein lies the main importance of proteins in the diet of the sheep. Carbohydrates, fats and proteins of foodstuffs can be used as a source of energy, but proteins alone can be used for the various phases of body building—for growth, for wool production, for milk production, for semen production and for keeping the body tissues in repair. Proteins also perform an essential function in the formation of hormones which are substances made by the ductless glands. These glands—including the pituitary, the thyroid, the adrenals, the testicles and the ovaries—make chemical substances which circulate in the blood. They control or influence practically every phase of the life and production of a normal sheep.

Proteins themselves are not simple substances and the building bricks of which they are made are known as amino acids. The molecule of an amino acid is simple when compared with that of protein, but it is complex when compared with a simple substance such as water. Being the building bricks of which proteins are made, amino acids contain carbon, hydrogen, oxygen, nitrogen and sulphur and, as they often include a large number of atoms in their make up, their arrangement admits of many variations. Twenty-five amino acids are known to occur in living tissue and one of them, cystine, is found in large quantities in wool. It is important to remember, however, that all amino acids do not occur in all proteins. Accordingly, it is necessary to arrange for proteins from more than one source to be included in the diet. This prevents any likelihood of a deficiency of one or more essential amino acids. This may occur even when the level of total protein intake appears to be sufficient in quantity to meet the requirements of both maintenance and production. In other words, quality of protein is as important as quantity.

The chief protein-rich foods used in stud sheep feeding includes legume roughages such as lucerne and clover hay, and the protein-rich concentrates linseed oilmeal, cottonseed meal, meatmeal and blood meal. Good quality lucerne hay or chaff contains approximately one third as much protein as cottonseed meal. Bran and pollard also are rich in protein, occupying an intermediate position between lucerne and cottonseed meal.

Minerals.

The mineral content of the foodstuff is most important because apart from blood and tissue function it governs the development of good strong bone, sound teeth and normal wool.

The minerals known at the present time to be of the greatest importance are calcium (lime), phosphorus, magnesium, copper, cobalt,

zinc and iron. Deficiencies of the last three have not been reported as affecting sheep in Queensland. Copper deficiency is known to be very important in many of the grazing areas of this State, but so far there is nothing to indicate that the chaff and grain fed to stud sheep are likely to be deficient in this substance. Adequate supplies of calcium, phosphorus and, to a lesser extent, magnesium are essential for the formation of good bone and sound teeth and also influence growth rate. During the process of digestion minerals are absorbed through the wall of the small intestine and enter the blood stream, which carries them to the various parts of the body. The calcium, phosphorus and magnesium, apart from their use by tissue and blood, are used mainly in the formation and maintenance of sound bone and teeth. The bone tissue is not static; it not only provides a solid supporting framework but also acts as a mineral storehouse and changes continually. Minerals are excreted constantly through the kidneys (in the urine) and through the lower bowel.

Iron, cobalt and copper are stored mainly in the liver. The two former minerals are used extensively in the formation of red blood corpuscles by the red bone marrow in the long bones. Copper performs a number of functions in the body, but one of the chief is the development of normal character in the wool. It was found that the inclusion of small amounts of copper in the ration fed to sheep, which were producing normal wool and which were on what might be considered a diet adequate in copper, led to a marked improvement in the character of the wool.

Small but variable quantities of calcium (lime) circulate in the blood, and its presence is important for the maintenance of heart rhythm and nerve-muscle function. Should the level of blood calcium drop, as sometimes happens in the case of ewes at lambing time, the muscles lose their normal responses and become flaccid. This condition is known as "Milk Fever."

Vitamins.

Vitamins are chemical substances which occur in minute quantities in foodstuffs. They are essential for the maintenance of good health. The various species of animals have different requirements. Many vitamins are known and have been isolated; others are known by their effects. They are usually designated Vitamin A, Vitamin B complex (of which there are at least six components), Vitamin C, Vitamin D, Vitamin E, etc.

Vitamin A appears to be the most important one from the point of view of the sheep feeder. It is derived from certain yellow pigments found in green grass, leaves, yellow maize, fresh good quality lucerne hay or chaff, and in carrots and pumpkins. It is stored in liver fats and accordingly liver oils are fed in case of Vitamin A deficiency.

Prolonged feeding on rations deficient in this vitamin may lead to temporary infertility on the part of the ram, abortion in ewes and night blindness. It may predispose animals to the development of urinary calculi.

Water.

All foodstuffs commonly fed to sheep contain water. It is important to know the percentage of water present in the food when high freight charges are likely to be incurred.

Dry Matter.

A knowledge of the dry matter which is left in a foodstuff after the water is extracted is of value in making up rations, because it is the quality of dry matter in a feed which governs the amount the sheep can eat. Correct feeding demands that the animal's appetite is satisfied, and that adequate nutrients be included in the ration to meet the body's requirements.

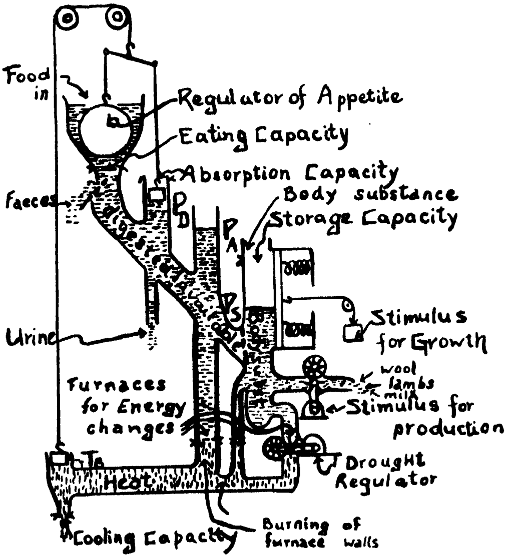


Plate 96.

SHOWS, DIAGRAMATICALLY, HOW THE ENERGY FROM FOODSTUFFS IS USED BY THE BODY (after Kleiber).

Ps is the animals potential for the storage of energy, which can be used for growth and/or production.

When it increases Pd (absorption potential) allows increases until Pa (potential storage capacity) is reached.

The time in which Pa, i.e., maximum capacity is reached will depend upon the rate at which energy is drawn off for growth and production of wool, milk and lambs.

When there is insufficient food intake to meet the body's requirements the drought regulator comes into operation.

Fibre.

Some foodstuffs contain more fibrous material than others. Oats, for instance, have a fibrous husk and this grain contains more fibre than an equivalent weight of maize. Much of this fibrous material is broken down into simpler and more readily digestible substances in the rumen (paunch) through the action of colonies of bacteria which are normally found in that organ. A knowledge of the fibre content of a foodstuff is of value for two reasons. Firstly, highly fibrous feeds are less digestible and therefore of lower food value than foodstuffs of lower fibre content. Secondly, much of the energy in fibrous feeds is given off as heat and cannot be used for liveweight increase or other productive purposes. In cold weather this heat fraction is valuable in maintaining normal body temperature whereas in hot weather it is largely wasted.

FOODSTUFFS AVAILABLE IN QUEENSLAND.

(I.) Roughages.

Lucerne Hay or Chaff.—Lucerne hay or chaff is good sheep feed because, among the roughages, it has good energy value and is rich in protein. It supplies Vitamin A and its mineral content is good in that it is rich in calcium. Many stud masters do not like feeding lucerne as they consider it colours the yolk too much. When it is fed, care should be taken to introduce it gradually into a ration and slowly increase the quantity until the maximum is reached.

Cereal Hay or Chaff.—Oaten or wheaten hay or chaff are often used for sheep feeding and, provided they are of good quality, they are useful for the provision of roughage. Their fibre content is high, but their nutritive value can be low, depending on the amount of grain they include. Their protein, calcium and Vitamin A content are lower than those of lucerne hay or chaff.

(II.) Concentrates.

(a) Energy-rich Concentrates.

Maize.—Maize is rich in starch, i.e. it has a high starch equivalent. It is not very rich in protein and accordingly it is necessary to supplement maize with some protein-rich concentrate. It is a useful source of Vitamin A. It is low in calcium. Maize meal is preferable for stud sheep.

Oats.—Oats have a higher fibre content than other grains; this is desirable in the feeding of young stud sheep as it leads to the development of a good roomy paunch. Oats have a fairly high starch equivalent, but like maize are not rich in protein nor in calcium (lime). A disadvantage of some oats is the barb, which might cause damage to the eye or some other sensitive part. On the other hand sheep like oats and it is a very safe concentrate to feed.

Wheat.—The feeding value of wheat is about the same as maize, but it contains little Vitamin A. It should be milled or crushed roughly and fed in carefully controlled quantities to prevent over engorgement or meal sickness. Wheat is low in calcium, but fairly satisfactory for phosphorus.

Grain Sorghum.—Grain sorghum is one of the best grain crops grown in Queensland. Its feeding value is about the same as maize, but usually it is a better "buy" on a nutrient basis. Its protein content may be lower than that of the other cereals. In most years the supply is good. The grain is very hard and accordingly it must be crushed. The mineral content is somewhat like maize, low in calcium, and not particularly high in phosphorus.

(b) Protein-rich Concentrates—

Meatmeal.—Meatmeal is a useful source of protein and is fairly cheap in normal circumstances. It is rich in essential amino acids, especially cystine, and accordingly it is a desirable component of rations for stud sheep fed for wool production. Meatmeal is very rich in calcium (lime) (CaO 5.14 per cent.) and phosphorus (P_2O_5), 4.88 per cent.).

Cottonseed meal.—Cottonseed meal is very rich in protein and has a fairly high energy value. Sheep seem to like it, but it has a disadvantage in that it may impart a yellow colour to any wool it soils. At the same time, some stud masters consider it darkens the yolk too much. It is only fair in calcium content, but rich in phosphorus.

Linseed Oil Meal.—Linseed oil meal has high protein and fat contents and this makes it a valuable foodstuff. It ensures sufficient yolk development and assists in keeping the digestive tract moving freely. Its mineral content is good, being fair in calcium and rich in phosphorous.

(c) Cereal By-products—

Bran and Pollard.—Bran is of particular value. It is highly palatable, rich in digestible protein, carbohydrates and fats, comparatively high in phosphoric acid, but poor in lime. It has a laxative effect. Pollard is richer in fat and digestible carbohydrates, lower in fibre than bran. It is inclined to become a pultaceous (soft, pulpy) mass in the rumen and could lead to meal sickness and accordingly is not often fed to sheep

(III.) Mineral Supplements.

Most rations contain adequate phosphorus for sheep, but many are deficient in calcium or the calcium (lime) and phosphorus present are unbalanced.

Accordingly it is often necessary to add calcium (lime)-rich mineral mixtures to the ration. Sterilized bone meal is a useful source of calcium (lime) for ewes, but care should be used in feeding it to rams as it may lead to the formation of calculi (stone in the bladder). As an alternative source, finely ground limestone may be used. It has been demonstrated clearly that the availability of calcium (lime) to the sheep depends on the fineness of the grinding and it is desirable that most of the limestone should pass through a sieve of 100 to the inch mesh.

Selecting Foodstuffs.—Cost and suitability have to be considered in selecting feed for stud sheep. Soy beans are good sheep feed, but are not grown in Queensland. On the other hand, maize and grain sorghum are produced in considerable quantities in this State and accordingly supplies should be reasonably plentiful. In stud sheep feeding cost does not assume the importance it does in the drought feeding of flock sheep, but nevertheless it should be considered and changes in the ration can be made to meet variations in the cost of the desired nutrients.

THE IMPORTANCE OF NUTRITIONAL BALANCE.

"Balance" is a term often used in connection with the feeding of animals. It can refer to the relationship between the body's demands for nutriments (for the carrying on of essential functions and continued production) and the available food, as well as the relationship of one substance to another. For instance, best results are obtained by feeding proteins and carbohydrates in certain proportions. It also is necessary to ensure "balance" in the feeding of calcium and phosphorus. The ratio of these two minerals should preferably be between 2:1 and 1:2.

Dietary deficiencies or imbalance of the various substances which go to make up a ration can produce unfortunate results, as well as affect the efficiency with which the available food is utilized. If protein-rich

foodstuffs which are of poor quality, when considered from the point of view of variation in amino acid content are used, a deficiency of certain essential amino acids may result. This might lead to impairment of growth through inability on the part of the animal to utilize those amino acids which were present. As a general rule, proteins of animal origin, such as those found in meatmeal or dried milk, contain more and a greater variety of the amino acids necessary for growth than do the proteins of plant origin.

Sheep fed on a correctly balanced diet receive an optimum amount of the energy-producing fats and carbohydrates in proportion to the amount of protein. This ensures that the energy requirements of the body are met by the carbohydrates and fats and the proteins are not burnt as fuel, but remain to fulfil their correct role as body builders. In other words, the protein is being used with maximum efficiency. Thus to obtain the best use of the protein in a ration it is essential that the supply of energy from non-protein sources be adequate.

Overfeeding.

Sheep may overeat if given the opportunity. On the other hand, many sheep are forced to overeat, from the point of view of nutrients consumed, because the rations offered them are deficient in either (*a*) dry matter or (*b*) roughage (fibre). This results in a ration which is too rich, and although the animal may eat sufficient only to satisfy its appetite it might quite easily be overfed. Heavy financial loss may occur from overfeeding, as resulting sickness may cause temporary or permanent disability of valuable animals. In addition, money and labour are wasted providing the sheep with more nutrients than they require or can utilize.

Underfeeding.

Under-nutrition may be quantitative, or qualitative or both. The effects of dietary deficiencies on animals depend on kind of animal, age, type of production, duration of the deficiency and whether or not adequate stores of the missing factor have been laid down previously when the sheep was on a complete ration.

A deficiency of fats, carbohydrates, proteins or minerals may retard growth. This is not so harmful if of only short duration. The body of a young animal has remarkable capacity for repair and can resume growth after a period of dietetic deficiency. However, it is desirable that this should not occur when dealing with young stud animals since a prolonged period of nutritional stress during the active stage of growth of a young animal may permanently affect its subsequent development. Animals so treated may be undersized at maturity.

It also is important that underfeeding or sudden food checks should not occur towards the end of pregnancy or pregnancy toxaemia (twin lamb disease) may result.

SOME EFFECTS OF NUTRITIONAL LEVELS.

The limiting effects of the plane of nutrition on wool production has been amply stressed. In a recent experiment conducted by the Council for Scientific and Industrial Research an average run of strong wool sheep were fed on a ration which allowed them the extremely low protein intake of only one ounce per head per day, i.e. the ration contained about 2 per cent. protein. When the protein content was

increased to about 16 per cent., so that the sheep's daily protein intake was about eight ounces per head per day their wool weights increased by about 250 per cent. This range of production was found to be less marked for fine wool sheep. In addition, large-framed strong wool sheep proved their capacity to utilize a sufficient quantity of the basal ration, which consisted mainly of straw, to maintain themselves. Small-framed fine wool animals were unable to utilize enough of such poor quality rations to fulfil the body's demands. However, when the diet was modified to contain more readily available nutrients the fine wool sheep reached their maximum production on a lower protein level than that required for strong wool sheep.

The variation in the amount of wool produced was accompanied by a marked alteration in both staple length and mean fibre diameter. Potentially strong-woolled sheep produced wool of fibre diameter equivalent to a 64-66's spinning count on poor diets; by improving the

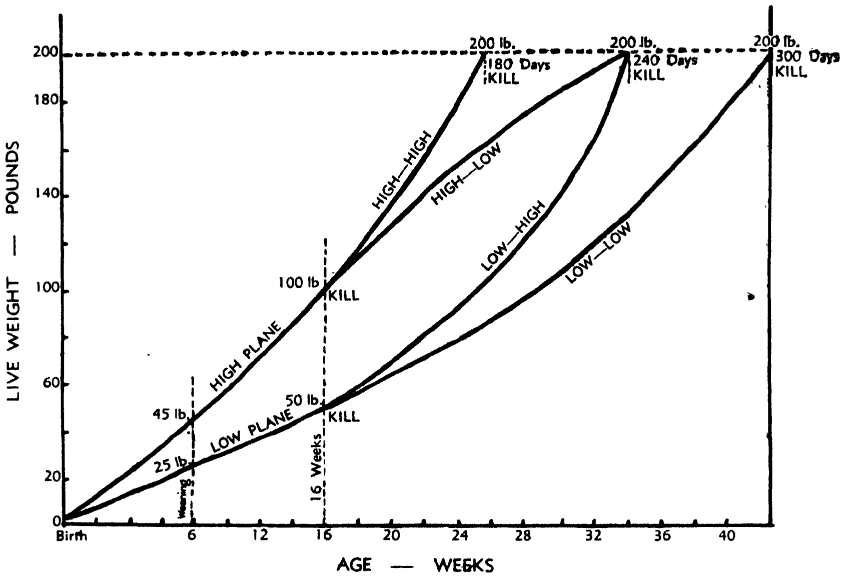


Plate 97.

Showing the Effects of Different Nutritional Levels on Sheep Fed for Mutton Production.

Four types of feeding were undertaken—

(1) High—high, i.e., the sheep were on a high plane of nutrition from birth to slaughter at 200 lb. live weight in 180 days.

(2) High-low, which group were well fed for the first 16 weeks and then transferred to a low plane of nutrition. These sheep were slaughtered at 240 days when they also had reached 200 lb. live weight.

(3) Low-high, in which the sheep were poorly fed for the first 16 weeks and were then transferred to a high plane of nutrition. They also attained 200 lb. live weight in 240 days.

(4) Low-low, when the sheep were poorly fed all the time and it took them 300 days to attain a live weight of 200 lb.

An examination of the carcasses at slaughter revealed that the animals fed on a high-high plane of nutrition had an optimum balance of muscle and fat to bone. Those on the high-low lacked fat and bloom. Those on the low-high were lacking in both muscle and fat. What fat was present was unevenly deposited.

Those on the low-low plane of nutrition had long, poorly covered bones and they lacked both muscle and fat.

protein supply the diameter became greater and when at the maximum level of production wool with a spinning count of 56's was produced. While the change in typical fine wool animals was less marked, the mean fibre diameter was found to vary with the protein supply, but neither a high production rate per unit area of skin nor the production of a strong wool was achieved by these animals.

A survey of the rations fed to stud sheep indicates that they usually contain between 10 and 13 per cent. protein, and preliminary experiments carried out in New South Wales indicate that it is not profitable to feed more than the optimum protein requirements in the hope of increasing the wool weights.

In another C.S.I.R. experiment, New England fine wool and South Australian Merino lambs were used and representatives from each "strain" were fed at different planes of nutrition, from the time they were lambs until they were several years old. The sheep on the higher plane of nutrition made more rapid growth; but of the two strains on the higher plane the South Australian strong wool sheep made much more rapid growth than did the New England fine wool sheep. Finally, there came a time when the New England sheep were unable to make further increases in body weight, whereas the South Australian sheep continued to make steady gains until there was a wide difference in the average weights of the two groups of sheep. On the restricted diets both strains made approximately the same growth.

Examination of the fleece weights cut by these sheep showed a marked difference in favour of the South Australian sheep within nutritional groups. A summary of the data from the first twelve months of the experiment indicates that the differences in the nutritional level brought about the following changes during this period:—

(1) The average weight gain made by all the animals, irrespective of the strain, was 56 lb. on the high plane of nutrition, and 19 lb. on the low plane.

(2) Dry weight of clean scoured wool produced from the unit area of skin tattooed on the side of each sheep at the time of their introduction into the experiment was, for those on the high plane of nutrition, 2.2 times that of the animals on the low plane.

(3) Staple length was correspondingly greater, being 8 cm. and 6.25 cm. respectively.

(4) The average super 80 class wool of the animal on the low plane of nutrition became a 64/70's in animals on the high plane.

(5) Conformation differences were most marked; those animals receiving adequate diet developed mature proportions within one year, while those on the low plane of nutrition retained a "leggy" juvenile appearance.

(6) The measured density of the fibre population decreased considerably during the first year of the animals' lives. Greater changes were noted in the sheep on the high plane of nutrition corresponding to the greater rate of skin expansion. The low plane retarded the development of the secondary (wool growing) follicles. In the fine wool animals the tattooed skin area increased in size by 103 per cent. between the ages of 2 and 16 months when the animals were on a high plane of

nutrition, but only by 40 per cent. when the animals were on a low plane. In the South Australian sheep, the increase in size of the skin areas between the ages of 2 and 8 months were 85 per cent. and 26 per cent., respectively, for the high and the low planes of nutrition.

The influence of the plane of nutrition on mutton sheep is no less marked than in merinos. Conformation of an animal determines the relative proportions of high- and low-priced cuts. At the same time, the relative proportions of different parts of the body change as the animal grows and with the way it is fed. Blocky joints are required, giving the least surface area to volume of meat. This means less drying on cooking and calls for greater depth of fleshing in relation to bone length.

Several investigations have been made into the effect of plane of nutrition on carcass quality and it has been found that a continued high plane of nutrition ensured the development of a high proportion of muscle and fat to bone and, in general, promotes the early development of all parts of the body which are usually late in developing. A low plane of nutrition had the opposite effect, encouraging the development of bone thickness and discouraging the development of muscle and fat.

The effects of variations in the plane of nutrition are shown diagramatically in fig. 2 and a summary of the carcass proportions is given below the figure.

The conclusions that are to be drawn from these experiments do not hinge so much on the respective merits of different breeds of sheep, but on the effects of feeding on sheep. Obviously, the way the sheep are fed and prepared for show is important and can influence very materially the reputation studs acquire. The important thing from the point of view of production, however, is the ratio of the feed supplied to the wool or mutton produced. This is referred to as the efficiency of food utilization.

Fig. 3 shows the relationship between this efficiency of food utilization and age and live weight increases. The form of these graphs varies with breeds and for strains within breeds. There also is ample reason to believe that efficiency of food utilization is an important consideration in the selection of sheep. Animals which are efficient convertors of available food to wool or mutton are well known to every flock master as "good doers" and they are more likely to stand up to "hard" conditions. This is obviously an important point and one worthy of selection. Gross overfeeding of stud sheep is not likely to make it apparent.

FEEDING STANDARDS.

(I.) Value of Feeding Standards in Planning Rations.

During the process of digestion the various foods are broken down to simpler units. Some of the available nutrients are absorbed into the blood stream, some utilized by microörganisms but often broken down again and absorbed, and the remainder excreted as faeces. On being absorbed the proteins, carbohydrates and fats have to meet the immediate demands made by the body for the maintenance of function. Anything which is left over is used for the production of body tissue (as in growth), of wool, of milk, of lambs by ewes and of semen by rams.

Obviously then the nutritional requirements of animals can be divided into:—

(1) Those for maintenance.

(2) Those for production.

As the result of many experiments the amounts of food required for these various functions have been measured. Unfortunately, similar methods of evaluating the foodstuffs have not always been adopted. The position is further complicated by the large number of factors which may affect maintenance requirements. The live weight of the animal, the weather (more food being required in cold weather to keep the animal warm), the level at which the sheep are used to being fed, the digestibility of the food, the individuality of the animals, their age, infestation by parasites, the heat produced by the food during the course of its digestion, as well as the interaction between two or more foodstuffs, all cause variation and allowance has to be made for them.

Many different systems have been used by animal nutritionists in an effort to provide an easy and accurate method for evaluating feedstuffs. Although all of them tend, perhaps, to oversimplify the problem of relative food values, they do provide a useful practical basis by which two or more feedstuffs may be compared with a reasonable degree of accuracy. One widely used method of comparison reduces the value of feedstuffs to units of starch equivalent. In this system each fodder unit is equal in food value to 1 lb. of starch. On this basis, oats contain 56 food units per 100 lb., wheat contains 72 food units, and good quality cereal chaff approximately 40 food units. Furthermore, stock maintenance and production requirements also have been worked out in terms of these fodder units and thus provide a ready method whereby definite quantities of food can be evaluated in terms of stock requirements or vice versa.

There are marked differences in the way the various breeds of sheep respond to feeding. Variations also occur between individuals within the same breed, and these variations hinge largely on the efficiency with which the sheep convert the available food to wool or flesh. The observant stud master is familiar with the individuality of his animals and knows that he must make allowances for them.

It also should be remembered that the weather conditions influence materially the nutritional requirements of animals. As most of the heat generated from food for the purpose of keeping the sheep warm comes from the digestion of fibre, it is advisable to decrease the amount of fibre in the ration during very hot weather. Conversely, fibrous foods should be fed liberally during very cold weather.

Feeding standards are a useful guide for the man planning rations and within a reasonable latitude, depending on the individuality of the animals, are much more accurate than guess work.

(II.) Maintenance and Production Requirements of Sheep.

The maintenance and production requirements of sheep have been measured on a number of occasions by different workers, and feeding standards have been defined for sheep for various weights and under different conditions.

The C.S.I.R.'s Nutrition Laboratory at Adelaide has worked with merino sheep on an improved "energy system" and their results compare favourably with world standards.

The following table shows the requirements of sheep of different live weights:—

TABLE 1.

Live Weight (lb.).	Dry Matter (lb.) per week.	Starch Equivalent (lb.) Requirements per week for		Digestible Crude Protein (lb.) Weekly requirements for	
		Maintenance.	Production per lb. L.W. increase per week.	Maintenance.	Maintenance plus production.
60	14·5	6·10	1·5	0·24	1·5
70	16·2	6·9	1·5	0·28	1·5
80	17·9	7·6	1·5	0·32	1·75
90	19·1	8·33	1·75	0·35	1·75
100	20·4	8·8	2·0	0·38	1·75
110	21·7	9·65	2·25	0·42	1·75
120	22·9	10·15	2·5	0·46	1·75
130	24·2	10·6	2·75	0·5	1·75
140	25·5	11·25	3·00	0·54	1·75
150	26·8	11·65	3·5	0·58	1·75
160	28·0	12·3	3·75	0·62	1·75
170	28·9	12·5	4·0	0·66	1·75
180	29·8	13·0	4·0	0·70	1·75
190	30·6	13·5	4·0	0·74	1·75
200	31·5	14·0	4·0	0·78	1·75

(III.) SPECIAL PRODUCTION REQUIREMENTS.

Growth and Fattening.—From the standpoint of the feeding of sheep, growth is essentially a storage of protein. Other substances, particularly water, are stored as the animal grows, but protein storage is the main characteristic of growth in all animals. This fact is of particular importance in the rearing of mutton sheep.

The growth of an animal is usually measured in terms of live weight increases, and if live weights are plotted against age a curve similar to that in fig. 2 is obtained. This clearly demonstrates the period of rapid growth when the animal is young and the subsequent diminution in growth rate. Figure 2 shows the relationship between live weight and cumulative feed consumption and it demonstrates the gradual decrease in the conversion of food into body substance as age increases.

These two figures explain why the protein requirements of young animals are high when compared with those of old animals. Although protein is an essential requirement for growth, the inclusion of starch foods is necessary to maintain nutritional balance. This is seen from table 1, the data of which has been plotted in figure 3. It will be noticed from this table that young growing animals require 1.5 lb. starch equivalent per week for 1 lb. weekly live weight increase while older animals may require up to 4 lb. starch equivalent per week, per 1 lb. (weekly) live weight increase. This is because live weight increases in older animals come mainly from fat which requires about 2 to 2½ lb. starch equivalent per week to ensure the storage of ½ lb. of fat.

The proportion of minerals, particularly of calcium to phosphorus in the diet of growing sheep, also is of importance. In an experiment

conducted by C.S.I.R., lambs were fed in three groups based on differences in the ratio of calcium (lime) to phosphorus. The results are tabulated below:—

Ratio of Calcium to Phosphorus	1:5.6 since weaning	1:5.6 till 9 months then 1:1.2 to 20 months	1:1.6 since weaning
Average live wt. when 20 months old	51.5 lb.	71.5 lb.	125.5 lb.

Pregnancy.—The period between conception and birth is, obviously, important in the life of both the ewe and the lamb. During the first three months of uterine life the lamb does not make very rapid growth, but thereafter its development is considerably hastened and at birth may weigh as much as 10 lb. During the last two months of gestation, the lamb makes heavy demands upon the food available to the mother which must maintain herself as well as feed her young. The ideal is to feed the ewes so that they make gradual but regular increases in body weight during this period. If a 110 lb. live weight ewe is to be fed so that her live weight increases by 10 lb. during the last two months of pregnancy it is clear from table 1 that an additional 12.5 lb. starch equivalent will have to be fed each month, i.e. approximately 3.1 lb. starch equivalent per week above maintenance requirements.

Extra food units are necessary for foetal development, i.e. the ewes should be fed extra to provide for the growth of the lambs they are carrying. Approximately 1 lb. of starch equivalent is required for every pound of foetus. Thus a ewe producing a lamb weighing 10 lb. at birth should, assuming 8 lb. of foetal development occurs during the last eight weeks of pregnancy, require an additional pound of starch equivalent per week.

Ewes, in common with all other female animals, have the power to draw on their body reserves to meet the demands of the growing foetus. While it is inevitable that this should be so it is important that the ration fed to inlamb ewes should be as near complete as possible as further heavy drains will be made on the mother during the period of lactation. This means the ewes should be on a gradually rising plane of nutrition from the commencement of the 4th month of pregnancy till the lambs are weaned. Increasing the ration of the ewes during the last two months of pregnancy ensures larger, better developed lambs and this is an important consideration.

Lactation.—Young lambs obtain large amounts of food from their mothers' milk. Milk is nature's ideal food and the maintenance of a good milk supply is an important consideration in the feeding of ewes. Merinos do not milk as long, nor as heavily, as the British breeds or crossbred ewes, and accordingly, do not require quite as much food for milk production. The table below gives an approximate comparison of the milking qualities of crossbred and merino ewes.

Month	Gallons per month. [X-bred.]	Merino.
1	8	5.4
2	9.7	3.6
3	7.2	2.8
4	5.4	

In planning a ration for ewes in milk, it is necessary to add 4 lb. starch equivalent per gallon of milk. Thus, if the ewes were producing about 5 gallons of milk per month they would require an extra 20 lb. starch equivalent per month or an additional 5 lb. per week above maintenance.

Information on the mineral requirements of ewes in milk does not appear to be available, but by analogy from the requirements of dairy cows they should receive from 10 to 15 gms. of calcium per day and from 15 to 20 gms. of phosphorus.

Semen Production.—The production of normal semen is the main function for which rams are kept. Abnormal semen may mean lowered fertility and poor lambings.

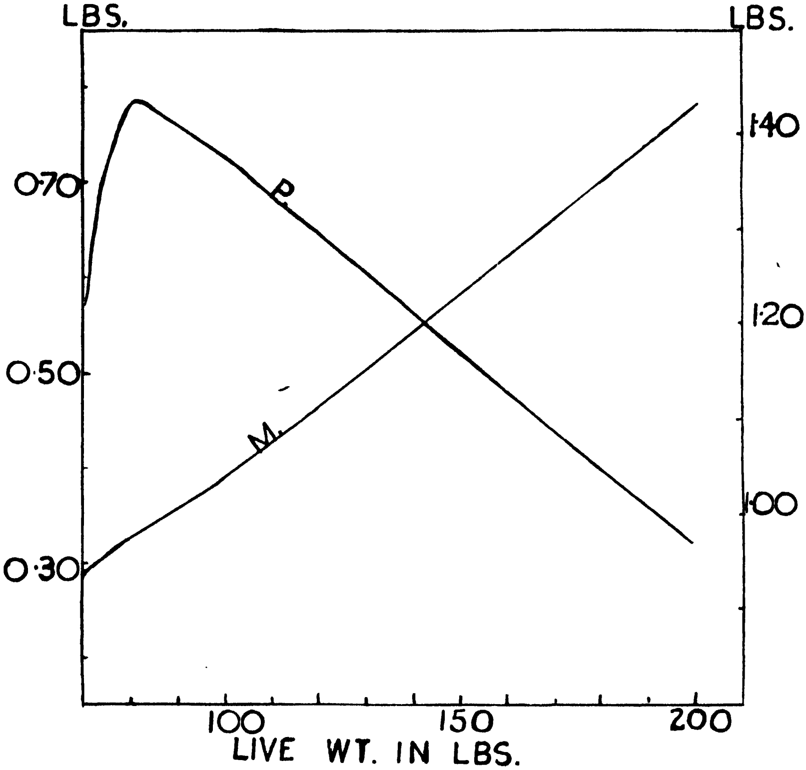


Plate 98.

SHOWING THE PROTEIN REQUIREMENTS OF SHEEP OF DIFFERENT LIVE WEIGHTS FOR MAINTENANCE (M) AND PRODUCTION (P) IN LBS. PER WEEK.

It is seen that the maintenance requirements increase with live weight increases and that the protein requirements for production are high while the animal is growing and it decreases as it reaches maturity.

Adequate vitamin A is an important essential in the diet of rams for a long period prior to, and during service. Vitamin A deficiency leads to degeneration of the cells lining the tubules in which the sperm are made. Adequate Vitamin A ensures this does not occur.

No Australian work is known in which protein requirements of rams at work have been investigated. Russian work indicates that

about 13 oz. of protein are required per week by a ram doing usual stud work. This would be covered by the 1.75 lb. per week fed to the heaviest ram, whose maintenance requirements are .78 lb. per week. This would leave .97 lb. (15.5 oz.) protein for production of semen and wool. In a stud ram at work, however, semen production would take preference over wool production and it may be necessary to exceed the accepted feeding standards as far as protein requirements are concerned.

Rams subjected to temperatures of over 95 deg. F. for long periods show varying degrees of seminal degeneration. Work done in America recently indicates that feeding certain proteins to rams may have an important effect on ameliorating these undersirable effects, and accordingly proteins from a wide range of sources should be fed.

CALCULATING RATIONS.

From Table 2 below, giving feeding values, it is a simple matter to calculate the components of a ration to meet the requirements of sheep of any particular weight.

TABLE 2.

COMPOSITION OF FOODSTUFFS.

Foodstuff.	Dry Matter.	Digestible Protein.	Starch Equivalent.	Calcium (CaO).	Phosphorus (P_2O_5).	Vitamin A.
Lucerne Hay	90	12	40	2·5	·5	+
Oaten Chaff	88	3·7	40	·36	·18	—
Wheaten Chaff	87	3·2	40	·29	·13	—
Corn	89	7·6	77	·02	·82	+
Oats (grain)	89	8·0	56	·14	·81	—
Sorghum (grain) ..	87	9·0	68	..	·75	—
Wheat	88	9·0	72	·05	·86	—
Bran	89	11·3	55	·20	2·80	—
Pollard	89	11·1	65	·12	1·58	—
Cotton seed meal ..	91	36·0	66	·36	2·7	—
Linseed Oil meal ..	89	22·4	80	·51	1·7	—
Meat and Bone meal ..	95	53·0	68	11·5	10·3	—
Meat Protein meal ..	95	65·0	84	5·14	4·88	—
Calphos	..	20·0	..	33·00	32·00	—
Ground Lime	..	..	..	47·8	..	—

Suppose it is desired to compute a ration for a young stud ram 120 lb. live weight. Reference to the feeding standards in Table 1 shows the weekly maintenance requirements are:—

	lb.
Dry matter	22.9
Starch Equiv.	10.15
Protein	.46

For production of 1 lb. live weight increase per week (as normal growth), and of wool the ram would require:

	Per week. lb.
Starch Equivalent	2.5
Protein (to make total of 1.75 lb.)	1.29

The total requirements will then be:—

	lb.
Dry matter	22.9
Starch Equivalent	12.65
Protein	1.75

Suppose a mixture is made of:—

	lb.
Lucerne chaff	50
Wheaten chaff	20
Oats (grain)	75
Maize	25
Linseed meal	5
Meat meal	2
Salt (fine)	1

By consulting table 2 showing the composition of foods it is easy to calculate, by simple proportion, the amount of dry matter, protein, starch equivalent, calcium and phosphorus in the ration. This was found to be:—

Foodstuff.	Amount.	Dry Matter.	Digestive Proteins.	Starch Equivalent.	Calcium.	Phosphorus.
Lucerne chaff	50	45·00	6·00	20·00	1·250	·250
Wheaten chaff	20	17·40	·64	8·00	·058	·026
Oats (grain)	75	66·75	6·00	42·00	·105	·607
Maize	25	22·25	1·90	19·25	·005	·205
Linseed meal..	5	4·45	1·12	4·00	·025	·085
Meat protein meal	2	1·90	1·30	1·68	·103	·098
Salt (fine)	1	..	..	..	..	..
	178	157·75	16·96	94·93	1·546	1·271
					$CaO : P_2O_5$ 1 : 0·82	
1lb. mixture contains ..	..	·88	·095	·53		
3lb. per day equals 21lb. per week	..	18·48	1·99	11·13	..	
3½lb. per day equals 24½lb. per week	..	21·56	2·33	12·98	..	
4lb. per day equals 28lb. per week	..	24·64	2·66	14·84	..	

As the feed requirements (per week) of the 120 lb. ram are:—

Dry matter 22.9 lb. Dig. Prot. 1.75 lb. S. Equiv. 12.65 lb. Feeding the animal 3 lb. of the mixture per day will not give him enough dry matter; will meet his protein requirements, but would leave him short in starch equivalent. A ration of 4 lb. per day would give him excess in dry matter, protein and starch equivalent, while 3½ lb. per day would meet his requirements for dry matter and starch equivalent, but would provide an excess of protein. This may not be particularly harmful, but is wasteful and is inclined to mask the important difference in efficiency with which some sheep convert protein to wool.

The substitution of wheaten chaff for the lucerne and of lucerne for the wheaten chaff will give an almost ideal ration at 3½ lb. per day, as is seen from the summarized results:—

——	Per week.		
	Dry Matter.	Digestible Protein.	Starch Equivalent.
3lb. per day	18·48	1·68	11·13
3½lb. per day	21·56	1·96	12·98
4lb. per day	24·64	2·24	14·81

The ratio of Calcium (CaO) to Phosphorus (P_2O_5) is 1 : 1·32.

Feeding Stud Ewes.—Rations for stud ewes are computed in the same way as those for rams. Live weight increases can be controlled by careful attention to the number of pounds of starch equivalent given to the sheep. It is not usual to have to consider lactation in ewes which are being prepared for show, but should it be necessary to feed ewes with lambs at foot the starch equivalent for milk production can be added to the maintenance requirements before working out suitable rations.

DISEASES ASSOCIATED WITH FAULTY FEEDING OF STUD SHEEP.

Calculi.—One of the most important diseases associated with the feeding of stud sheep is urinary calculi of rams.

Urinary calculi are deposits of salts which form in the urinary tract. They congregate most commonly in the bladder or tube of the penis, and may vary in size from sebulous grains to deposits up to about the size of a marble. Calculi cause considerable loss amongst Queensland sheep. Most commonly they are seen in stud sheep which are being stall fed. Many valuable animals have been affected. As calculi form gradually, it is not possible to tell when rams are in the "incubative" stage and often animals have died after sale and delivery to their new owners. This unfortunate occurrence has brought more than one stud into unnecessary disrepute.

All the indications are that the causes of calculi are dietetic. The available evidence suggests that Vitamin A deficiency, imbalance of calcium, phosphorus and magnesium are probably the main factors operating in the formation of urinary calculi in sheep. It is possible that there are other factors involved which have not yet been recognised, and further work is proceeding.

Conditions leading to concentration of urine, such as dry feeds rich in minerals, hot dry climate, and drinking water with appreciable concentrations of magnesium, or calcium carbonates may be contributing causes.

Prevention.—Avoid dietetic errors mentioned above by obtaining assistance from the Department of Agriculture and Stock in planning rations. Inclusion of sufficient Vitamin A is important. Excess phosphorus in bran or grain should be offset by supplying calcium as finely ground limestone or calcium-rich foods. Feeding a ration over rich in

calcium is often helpful as it assists in the excretion of magnesium through the bowels. (Trouble sometimes starts when bowel excretion of magnesium is low and this substance is excreted through the kidneys.) Avoid bone flour as a sole source of lime as it is rich in magnesium.

Treatment.—Treatment is difficult and not always successful.

If the blockage is in the urethral process (the worm) the condition may be relieved by amputating the process and this will not interfere with the fertility of the ram. However relapses frequently occur, blockages taking place further back. In these cases massage towards the orifice is sometimes useful.

It may be helpful to acidify the urine of the sheep by giving daily doses of ammonium chloride (15 grains).

Pregnancy Toxaemia.—(Twin Lamb Disease). Twin Lamb Disease is a misnomer for this condition as it does not occur only amongst ewes carrying twin lambs.

A considerable amount of work has been done on pregnancy toxaemia but the exact chemical changes which take place in the body when the disease develops are not, as yet, clearly understood. It is known, however, that during the terminal stages of pregnancy the demands on the mother made by the lamb are very great, and if the ewe's food intake is not large enough she draws on her own body supplies to meet this increased demand. Apparently times occur when the rate of withdrawal from the body stores exceeds the rate at which the liver can convert the stored nutrients into a form in which they can be readily utilised by the body. When this happens, poisonous by-products are formed as the result of the incomplete conversion and the ewes develop typical symptoms of pregnancy toxaemia. As the damage done during these changes is often irreparable treatment is difficult and it is better to aim at prevention. This consists of keeping the sheep on a rising plane of nutrition right up to lambing and preventing any breaks in the regular daily intake of food through yarding for prolonged periods.

Milk Fever.—The disease commonly known as milk fever is often confused with pregnancy toxaemia. Milk fever is not a good name for the condition as it is brought about by a sudden diminution of the amount of calcium circulating in the blood. The condition responds readily to treatment, which consists of the injection of from 30-50 cubic centimetres (1-1¾ oz.) of 20 per cent. (1 in 5) calcium-boro-gluconate solution. The feeding of a ration adequate in calcium prior to lambing and during lactation is, however, an important consideration in the management of stud ewes which are being hand fed.

Bloat and Meal Sickness.—Bloat sometimes occurs amongst fed sheep and "meal sickness" is fairly well known by most men who have supervised sheep feeding. Animals are predisposed to the conditions by an insufficiency of fibre in the ration, i.e. not enough dry matter occurring in the form of hay or coarser grasses, such as Mitchell, from a little grazing. Meal sickness can be brought about by sheep eating too much finely ground cereal such as wheat, particularly if the ration is deficient in bulk. With both these conditions prevention is better than cure and correctly planned rations can help a good deal in preventing trouble.

Prussic Acid Poisoning.—It has been clearly demonstrated that prussic acid poisoning may occur amongst stud sheep which have been subjected to a prolonged period of fasting and then fed liberal amounts of linseed meal or nuts.

Obviously, this is not likely to occur when stud sheep are being prepared for show, though it may take place in the case of animals which are transported long distances by rail or motor float.

Symptoms shown are usually of short duration and they include rapid respiration and cyanosis of the visible mucous membranes. Death is sudden.

Treatment consists of giving affected sheep a 2 oz. drench of photographic hypo (sodium-thio-sulphate) (5 oz.) in water (1 pint).

Prevention consists of generous supplementary feeding of rams with good roughages, concentrate mixtures, or good quality hay for ten days prior to trucking; avoiding long periods of starvation while in transit, and preventing the animals from having ready access to unlimited supplies of linseed nuts on arrival at their destination.

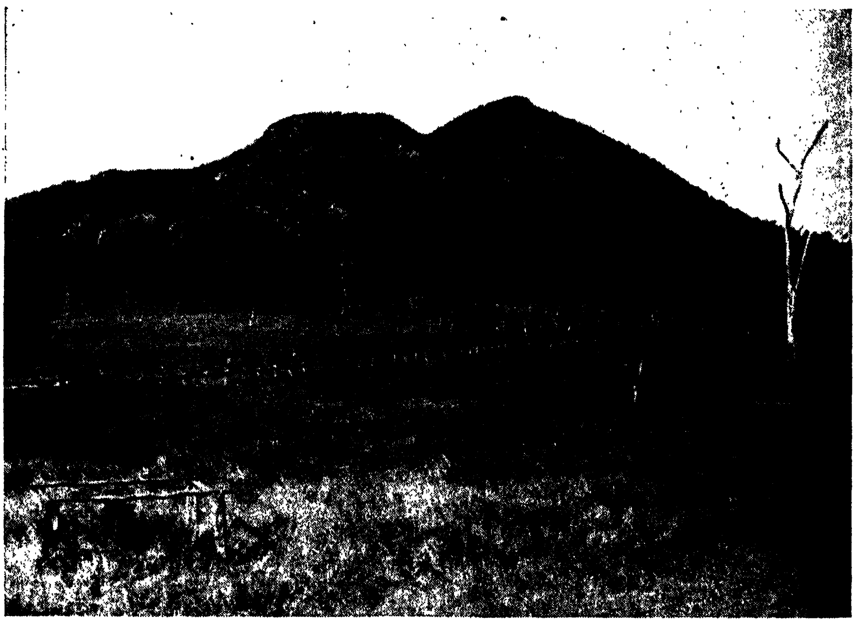
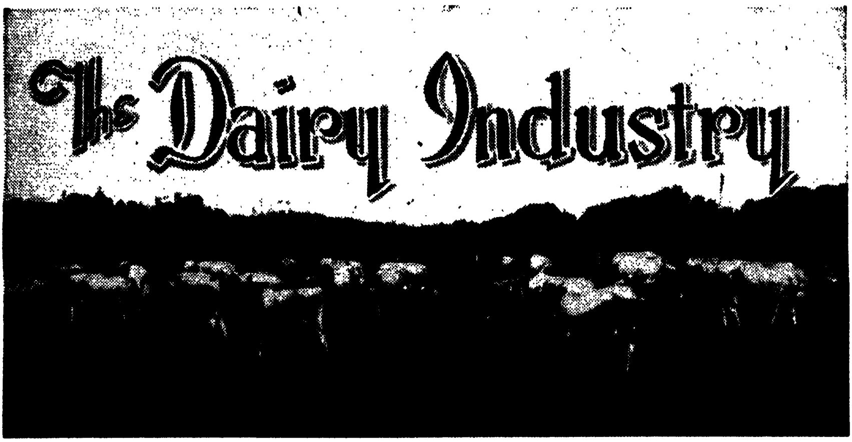


Plate 99.

MOUNT MOON, WEST MORETON.—View from the homestead, Kingpah, the property of Mr. J. Faulkner.

[*Photograph, Department of Agriculture and Stock.*



Low Butterfat Tests in Milk.

F. C. COLEMAN, Senior Dairy Adviser.

FACTORY and depot managers who are handling milk may soon be faced with a recurrence of one of the industry's bugbears, namely, low butter-fat tests which fall short of the minimum standard of 3.3 per cent. butter-fat. During the greater part of the year attention is centred on the bacteriological quality of milk, but from July until October or November low butter-fat tests become a serious problem, requiring the attention of all concerned.

Standard of Milk.

Under "*The Dairy Produce Acts,* 1920 *to* 1944," the standard of milk is defined as follows:—

> Milk shall be the normal, clean, fresh secretion obtained by completely emptying the udder of a healthy cow, properly fed and cared for, and shall be exclusive of the milk obtained during fifteen days immediately prior to and ten days directly following on parturition. It shall contain not less than eight and five-tenths part per centum of milk solids not fat, not less than three and three-tenths part per centum of milk-fat, and not less than twelve parts per centum of total milk solids. It shall not contain any added water, separated milk, preservative or other foreign substance, and shall not have had any milk-fat removed from it by skimming, separating, or any other process. Its freezing point shall be not higher than 0.55 degrees centigrade below that of pure water. The specific gravity of the total milk solids shall be not higher than 1.35.

Certain conditions operate during the short but difficult period from July to November, and all contribute to unsatisfactory tests. It is the purpose of this article to name and explain them.

A certain dairy officer testing cows for a well-known breeder remarked on the low tests of the cows during September and October, whereupon the breeder said, "I have kept records for the past forty years and I would like you to see them. These show that at this time every year the cows always test low." That was several years ago and experience since has proved the truth of this statement.

Main Causes.

The experience of those controlling the quality of milk in the Brisbane District has been that two main factors operate, together with minor, but none the less important ones.

Calving Period.

In most dairy herds a large proportion of cows calve during the spring. This means a decided increase in volume of milk providing that the weather, crop and pasture conditions are favourable.

Soon after calving, however, there is a gradual reduction in the percentages of fat and solids-not-fat which tend to fall for the first three or four months, at which time the quantity peak is usually reached. The fat content, then, remains fairly steady for a period and then starts to increase as the quantity of milk decreases.

It frequently happens during the spring that as many as 70 per cent. or more of milkers in a herd are those which have just freshened. It is therefore obvious that in such cases the great bulk of the milk produced by them will be of low butter-fat content.

This applies to all breeds, but is of special significance when the breed or breeds of the cows in the herd comprise the lower testing breeds and strains.

Effect of Interval Between Milkings.

As the period between milkings is increased so will the tests vary, decreasing with the longer period and greater volume and increasing with the shorter period and smaller volume.

Many suppliers producing milk for the Brisbane market, milk at intervals of 15 hours and 9 hours in the July to November period; and quite a number have been known to milk at intervals of 16 hours and 8 hours.

It can thus be clearly seen that in both these instances if the herd consisted mainly of fresh cows and a sample of their bulk milk were taken at the 15th or 16th hour, the test would be very near and probably below the minimum standard of 3.3 per cent.

It is stated that in the case of mixed milk from a herd, for each hour that the interval exceeds 12 hours, the fat is lowered 0.10 to 0.15 per cent., and for each hour the interval is under 12 hours the fat is raised 0.20 to 0.25 per cent. Thus, if the milking periods were even and the morning's test was 3.5 per cent., it could be reduced to below 3.1 per cent. if the period were lengthened to 15 hours.

Experiments carried out at Garforth and Cambridge on the effect of intervals between successive milkings on the composition of milk show results as follow:—

Period of Experiment. days.	Length of Night Interval. hours.	Fat. per cent.	Length of Day Interval. hours.	Fat. per cent.
14	15	2·87	9	4·26
28	12·5	3·18	11·5	3·80
21	15	2·94	9	4·40
14	12	3·64	12	3·45
14	16	2·33	8	4·47

In the first place, therefore, the bulk test of the herd is very seriously reduced by milking a high percentage of fresh cows and in the second place it is further aggravated and tests reduced even lower still by such long periods as 15 and 16 hours between evening and morning milkings.

These two factors have by far the greatest influence on butter-fat tests and their combination, at a period of the year when the nutritive value of pastures in Queensland is believed to be at a low level, is responsible for seriously reducing the food value of milk. In fact, milk which fails to reach the 3·3 per cent. standard is not legally considered to be milk and can be dealt with as required.

Condition of Stock.

There are other reasons for low tests, an important one being the condition of the milkers. Fat tests of cows in poor condition, due to the drought, sunk to a very low level last year, and whenever stock reach that state it is reasonably certain that if the cow is giving any milk at all it will test extremely low.

Low Testing Cows.

Many milk producers have set their eyes on "quantity above all else," and so in a great many herds there exists a considerable number of low-testing animals. A proportion of the latter will considerably depress the bulk test of the herd and their exclusion would have the opposite effect.

This question is exercising the minds of many milk producers at this very moment, as the following extract from *The Northern Star* (N.S.W.), of 24th May, 1947, will show:—

> Faced with reports from health inspectors that the milk being supplied to Brisbane and other towns often showed a shortage of butter-fat—which under the *Pure Foods Act* is the same as being considered to have been adulterated—many milk suppliers from over the border have been visiting Kyogle dairy farms with a view to buying certified dairy cows which have high tests over a long period of testing and the heifers from such tested cows.

Mastitis Milk.

The inclusion of mastitis-affected milk in the bulk supply can be very easily done if strict vigilance is not observed. Such milk will not only have an adverse effect on methylene blue tests, but will also lower the butter-fat tests. The fat and casein contents of cows suffering from this disease are markedly reduced.

Careless Handling of Milking Machines.

Carelessness and thoughtlessness in handling machines is a common cause of milk adulteration. The practice of flushing out the milk line with cold water before and after milking can be a cause if care is not taken to prevent the water entering the milk in the vat or cans. This should be very carefully avoided.

Age of Cows.

The butter-fat test of cows seems to decrease with increasing age, being more noticeable after the ninth and tenth years. This is not regarded as a serious factor, however.

Effect of Thorough Stripping on Butter-fat Test.

The fat content of milk gradually increases as the milking of the cow progresses, so that the strippings contain the highest percentage. This fact is generally recognised by most dairy farmers, but the wide difference between the first-drawn and last-drawn milk may surprise many.

The following table by Van Slyke illustrates this increase:—

VARIATION IN FAT CONTENT OF MILK DURING MILKING.

(Percentage of Fat.)

Portion.	Cow A.	Cow B.	Cow C.
First	0·90	1·60	1·60
Second	2·60	3·20	3·25
Third	5·35	4·10	5·00
Strippings	9·80	8·10	8·30

It is very evident, therefore, that neglect to strip thoroughly may have a very reducing effect on the fat content at any time of the year, but particularly so in this low testing seasonal period. Other factors such as feeding, changes in feeding, abnormal weather conditions, oestrum or heat, and efficiency of milking may all affect the test.

Methods of Prevention.

Intervals between Milking.

In those herds where low butter-fat tests are being experienced an effort should be made to so alter times of milking that there is no wide difference between them. Conditions seldom exist where two equal periods of 12 hours are possible, the time of pick-up by the carrier and other circumstances affecting this arrangement. It is very often possible, however, to arrange for a 13-hour period between evening and morning milking and an 11-hour period between morning and evening. This will have a marked effect in improving the butter-fat test, particularly if other recommendations are followed. Rearrangement of milking times may cause some inconvenience for a while, but the period for which this is necessary is not a long one, and a reversion to more convenient times could be made when tests show an improvement.

Spring Calving.

There are many advantages to be gained by having a separate paddock for the bull as opposed to allowing him free range with the herd. One of these is that calvings may be regulated, and this is advantageous when the feeding-off of crops has to be considered as well as the seasons, and also the important question of subsidies. Apart from these, however, if portion of the herd calved at the beginning of the winter instead of the majority calving in the spring, the danger of low fat tests would be considerably minimised.

When certain conditions operate together the reduction of the fat test to a very low level is most marked. These conditions, which usually operate at one and the same time and are responsible for bringing the tests of even high-testing breeds down below the minimum standard are—(1) the great majority of milkers consisting of fresh cows; (2) a

long interval of 15 or 16 hours between evening and morning milking; and (3) the period of the year being a low nutritional and low testing one. It is therefore advisable to regulate calvings to avoid having too many cows freshening at the one time, otherwise low fat tests are inevitable. If calves are being reared, milk from these low-testing fresh cows could be reserved for feeding them.

Stripping.

It has already been shown that the last milk from each quarter is particularly rich in butter-fat, whilst the first milk contains a low percentage of fat. It is therefore suggested that cows should not be stripped during the evening milking, in order to allow the higher-testing milk to be carried on to influence the milk the following morning, when the cows should be stripped very thoroughly. During the morning milking, also, the test could be further improved by rejecting a few jets of the low-testing fore-milk from each quarter, which thus increases the test of the remaining milk. In any case, the rejection of this milk is always a good practice, as it contains numbers of bacteria which have gained entrance through the opening of the teat canal. It also enables the milker to examine the milk for mastitis before adjusting the teat cups.

Mastitis.

As previously explained, milk affected with contagious mastitis can be very low in butter-fat, and, in addition, may be responsible for a quick reduction of the methylene blue time. Milk affected with contagious mastitis, if not pasteurised, may cause septic sore throat in human beings and food poisoning in children. The importance of detecting it, therefore, is very evident. Milk from each quarter should be carefully examined by the strip-cup method before milking is continued; and any milk showing pus, blood clots, or even minute pinpoints of curd, must be excluded from the bulk supply. Remember that low tests and mastitis go hand in hand.

Adulteration of Milk.

It has been wisely remarked that "the only legitimate way to put water into milk is to give cows plenty of it to drink." Frequently, however, during the process of milking by machine, water is allowed to run into the milk. This is adulteration, pure and simple, even though it may be unintentional. When chlorinated water is run through the teat cups and milk line prior to milking, every care should be taken to see that the milk vats, cooler, buckets, and cans are completely devoid of this water before commencing to milk. Then, again, when milking has ceased and the first treatment of cold or warm water is being given, the same care must again be exercised. If a bucket is placed beneath the releaser to catch this water, the bottom of the bucket should be scrupulously clean. This method, however, is not recommended. Where adulteration of milk with water is suspected it is detected by the lactometer and butter-fat tests.

Condition of Stock.

The great advantages of keeping stock in good condition at all times, not only during the lactation period but also before calving, are so well known that they need not be stressed. It should be kept in

mind that low condition and low tests usually go together. Investigations into low-fat tests now being carried out by officers of this Department and field officers of the Milk Board show that where the cattle are well fed and where the feed is well balanced better results are obtained.

Order of Milking.

Cows yielding large quantities of milk should be milked last in the evening and first in the morning. This will balance the milking periods for those higher-producing but lower-testing animals.

Low-testing Animals.

An efficient dairy farmer, apart from his other qualifications, is the one who is in a position to assess the worth of each animal in his herd; one who knows not only exactly the quantity which each cow gives but also its butter-fat test. Some individual cows are consistently low-testing, and unless this low test is compensated for by particularly large quantities of milk it is unprofitable to retain them in the herd. Enlightened farmers realise that there is only one method of ascertaining this and that is to test each animal at regular intervals throughout the lactation period.

Removal of Teat Cups.

If teat cups are left on a cow too long after it has been milked a small amount of milk left in the loop of the rubber milk tube will become churned. This will be drawn through and will be caught in the filter pad of the strainer. The loss of this valuable butter-fat will decrease the test. This is very noticeable in cows which have been milking for some time, their milk naturally being higher testing. In addition, damage to udder tissue may result unless teat cups are removed promptly.

TEMPERAMENT IN DAIRY COWS.

Some cows are naturally aggressive while others are timid. The aggressive beast is a menace in the assembly yard and may cause considerable injury to other cows, involving the owner in financial loss through loss of time in treating the injured animals, cost of medical supplies used, and depletion of yield from affected animals.

In most cases, the most profitable remedy is to dispose of the offending animal, but in others, a satisfactory solution is to be found in dehorning. The main objection raised to dehorning is that the appearance of the herd is somewhat spoilt. In the commercial herd this factor should not be taken into account, because the principal objective is milk and butter fat yield, and show value is negligible. In the case of pure bred stud book herds, objections have been raised to this practice, but these cattle represent a very small percentage of the milking cows in the dairy herds, and because of the handling and care which they receive from birth, they are, on the whole, much less aggressive in the yard and respond more readily to the process of "breaking in" than is the case with grade cows.

The timid beast causes less damage in a herd than the aggressive animal, but at the same time, its presence in the herd is a disturbing factor which causes loss of production. Some animals will, at the sight of any unusual object or movement, cause a mild stampede, in which injury is likely to occur to the most docile beast in the herd through violent contact with other animals or through being rammed on to wire or other fencing material.

Both aggressiveness and timidity are hereditary qualities, and in culling on account of these defects it may be advisable to remove more than one member of a family from the herd.

The Detrimental Effect of Sunlight on Milk.

V. R. SMYTHE, Assistant Dairy Technologist.

IT is well known that sunlight is very beneficial in the dairy. The ultra-violet rays in sunlight are deadly to bacteria, and in this fact lies the explanation why so many milking sheds, which are constructed so as to exclude sunlight, are so often evil smelling. In such a state, of course, they present a menace to clean milk production. But it is not so well known that sunlight has a very adverse effect on milk itself. The ultra-violet rays penetrate no more than a fraction of an inch into milk, and consequently any bactericidal action, except where the milk may be in a very thin film, is negligible.

When milk is left exposed to sunlight it often develops an objectionable powdery taste. This taste is the forerunner to the tallowy and rancid flavours which render milk quite undrinkable. These undesirable flavours result from oxidative changes in the milk fat brought about by the sunlight. It would seem that once these changes commence they can go further without the milk being again exposed to sunlight.

Sunlight is also detrimental to the vitamin C of milk. It was found by experiment that milk in clear glass bottles exposed for one hour to indirect light in a shady place lost approximately half the vitamin C it contained. The longer the exposure the greater was the destruction. It also has been found that this effect of light is proportional to the amount of ultra-violet radiation it contains, which would make sunlight much more harmful than indirect light. When, however, milk is contained in brown bottles, the destruction of vitamin C is very slight.

The amount of vitamin C normally present in cows' milk is insufficient for human needs, and for infant feeding some other rich source, either orange or tomato juice, is used to make up the deficit. Nevertheless, even though milk is deficient in this important food element, there is no advantage to be gained by destroying what is present.

Another vitamin found in milk, riboflavin, also is sensitive to the destructive action of sunlight. Riboflavin is one of the vitamins grouped under the heading of vitamin B and is present in considerable quantities in whole milk, skim milk, and whey. In one experiment, milk was stored in clear-glass pint bottles and exposed to direct sunlight on a porch. More than one-quarter of the riboflavin present was destroyed in half an hour, and almost three-quarters in three and a half hours. As with vitamin C, the loss was greater the longer the sunlight was allowed to shine on the milk. In another experiment, the loss of riboflavin caused by sunlight was reduced to one-sixth with raw milk and one-eleventh with pasteurized milk by using brown glass instead of clear glass bottles.

Sunlight may cause a further deterioration in milk by warming it, thereby facilitating the growth of milk-spoiling bacteria. The obvious lesson to be learnt from this is to allow as much sunlight as possible to get into the dairy, but not to allow it to shine on milk.

PRODUCTION RECORDING.

List of cows and heifers, officially tested by officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S., Jersey, and Guernsey Societies' Herd Books, production records for which have been compiled during the month of August, 1947 (273 days unless otherwise stated).

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Bunya View Thelma's Pride	W. D. Davis, Chinchilla	10,071·7	403·988	Bingleigh Royal
Murray's Bridge Flower	C. K. Roche, Wheatvale	9,045·7	322·132	Chasmin Jellicoe
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Jamberoo Princess 2nd	A. F. Ezzy, Mt. Emblyn	6,558·4	285·210	Murray's Bridge Florrie's Prince
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Ardilea Sadie 5th	Hinricksen and Sons, Clifton	7,227·75	264·243	Newstead Musician
Ardilea Flower 17th	Hinricksen and Sons, Clifton	7,350·90	261·810	Newstead Musician
JERSEY.				
MATURE COW (STANDARD 350 LB.).				
Westwood Eileen	F. Porter, Cambroon	8,594·2	506·159	Hunstreets Emperor's Volunteer
Palmridges Doon	H. Sigley, Jaggan	6,180·7	421·081	Overlook Bindle
Westwood Lassie Belle	F. Porter, Cambroon	7,324·6	399·037	Stretton Carnation's Volunteer
Windsor Princess Isobel	H. G. Johnson, Gleneagle	7,400·85	390·814	Bobs of Wingate
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Westwood Silverelda	F. Porter, Cambroon	7,756·15	419·667	Westwood Combination
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Brooklands Cream Flake	W. S. Conochie, Sherwood	8,342·3	465·766	Englove Cunning Victor
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Mayfair Beauty 8th	J. W. Carpenter, Helidon	4,893·4	296·595	Trecarne Golden King 2nd
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Lawnview Gracie	W. A. Berderow, Fairney View	6,325·2	373·287	Oxford Maxie
Grasmere Victory's Carina (365 days)	F. Z. Eager, Petrie	8,210·75	368·149	Oxford Brown Victory
Brooklodge Lovely	J. J. Ahern, Connondale	5,967·85	337·139	Trecarne Some Victor 4th
Trinity Lady Graceful	J. S. McCarthy, Greenmount	5,893·05	286·477	Trinity National Victory
Brooklodge Ruthenia	J. J. Ahern, Conondale	4,863·15	267·816	Trecarne Some Victor 4th
GUERNSEY				
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Tattenbar Patsy	W. A. K. Cooke, Witta	6,267·3	305·471	Laureldale Trump
Laureldale Veronica 3rd	W. A. K. Cooke, Witta	5,408·35	279·354	Minnimurra Tcpsy's Sequel 2nd
SENIOR, 2 YEARS (STANDARD 230 LB.)				
Lindwood Calm	E. G. Foxton, Maleny	5,450·95	272·312	Lindwood Buddy

Beef and Dairy Cattle Champions.

R.N.A. SHOW BRISBANE, 1947.

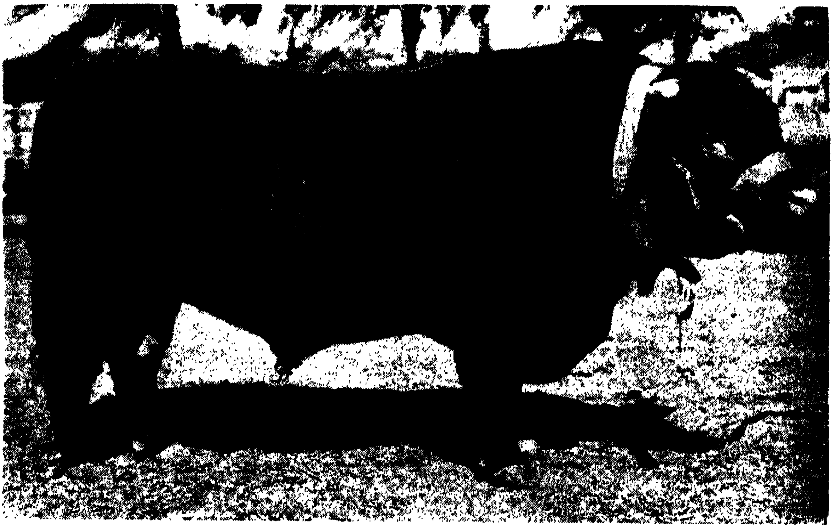


Plate 100.
Champion Shorthorn Bull.—"Coonong Officer Commanding."
D. R. McCaughey.

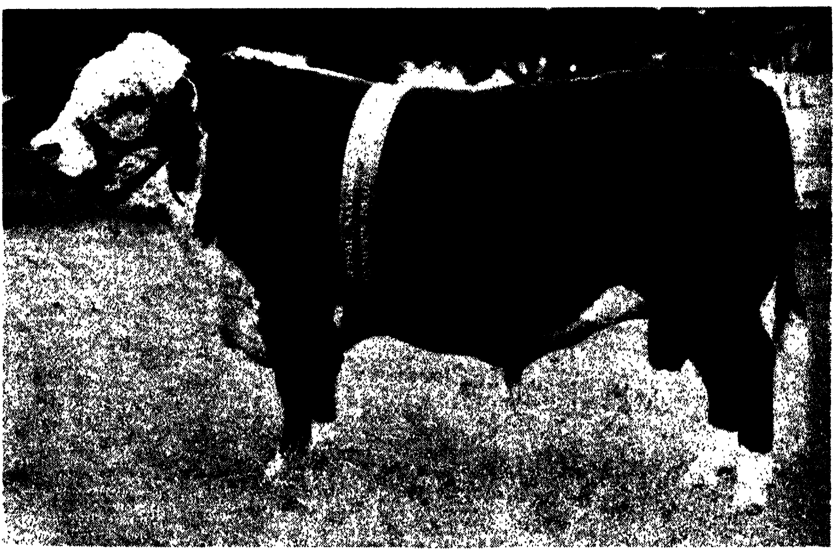


Plate 101.
Champion Polled Hereford Bull.—"Eulogie Commissioner." E. W. McCamley.

Plate 102.
Champion Hereford Bull.—"Bexley Demonstrator." Hays Bros.

Plate 103.
Champion Hereford Cow.—"Myall Carissima 10th." Fenwick Bros.

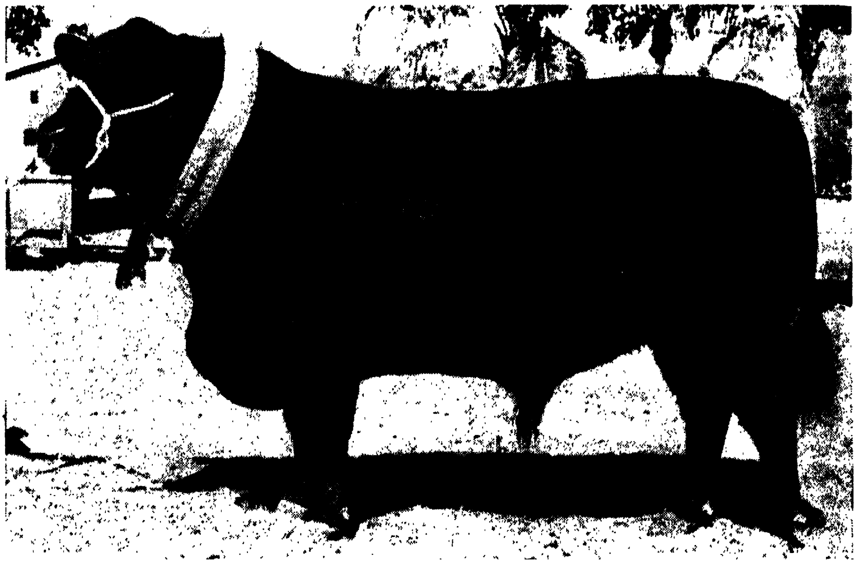


Plate 104.
Champion Aberdeen Angus Bull.—"Wallah Ottawa." H. A. White.

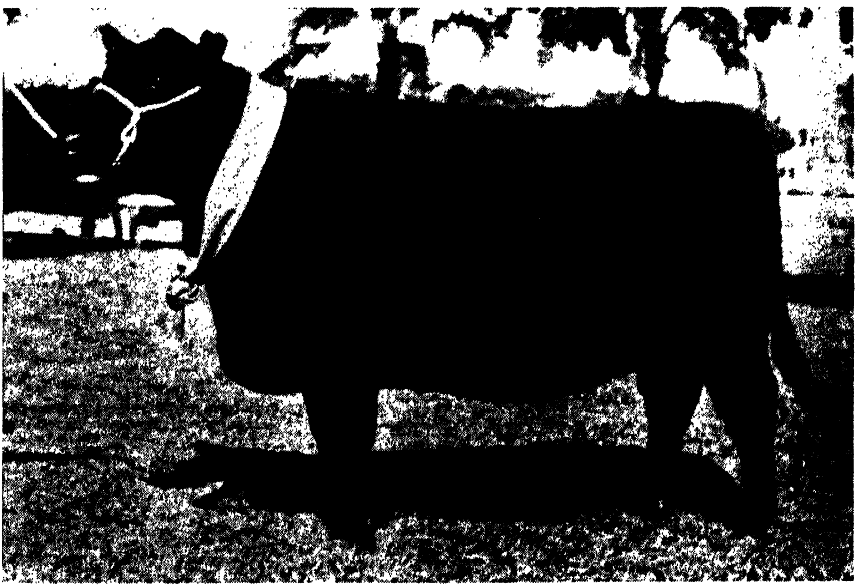


Plate 105.
Champion Aberdeen Angus Cow.—"Bald Blair Bint." H. A. White.

Plate 106.
CHAMPION AUSTRALIAN ILLAWARRA SHORTHORN BULL.—"Sunny View Evelyn's Masterpiece." Klein Bros.

Plate 107.
CHAMPION AUSTRALIAN ILLAWARRA SHORTHORN COW.—"Ennismore Bud 2nd." E. W. Jackson.

Plate 108.
Champion Jersey Bull.—"Glenview Royal Chief." A. L. Semgreen.

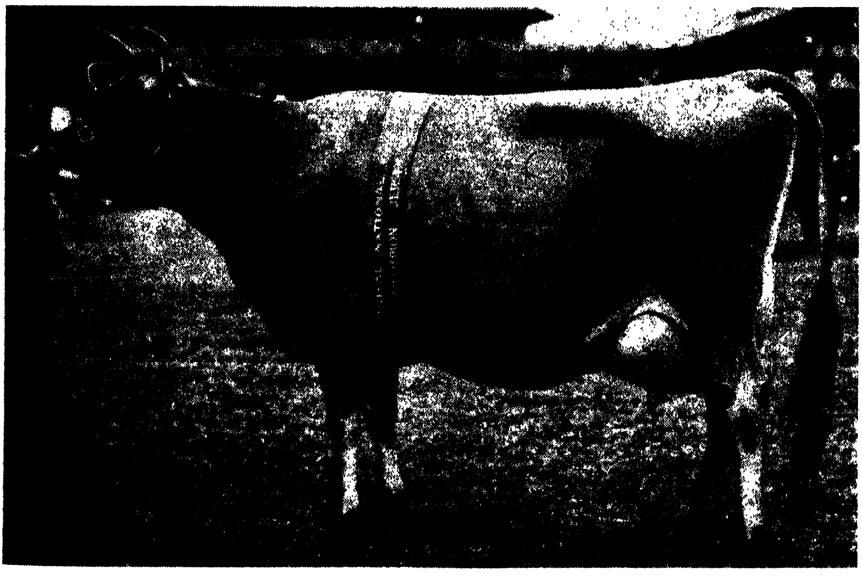


Plate 109.
Champion Jersey Cow.—"Trecarne Dairymaid 4th." T. A. Petherick.

Plate 110.
CHAMPION AYRSHIRE BULL.—"Myola Master 2nd." M. J. Brownlie.

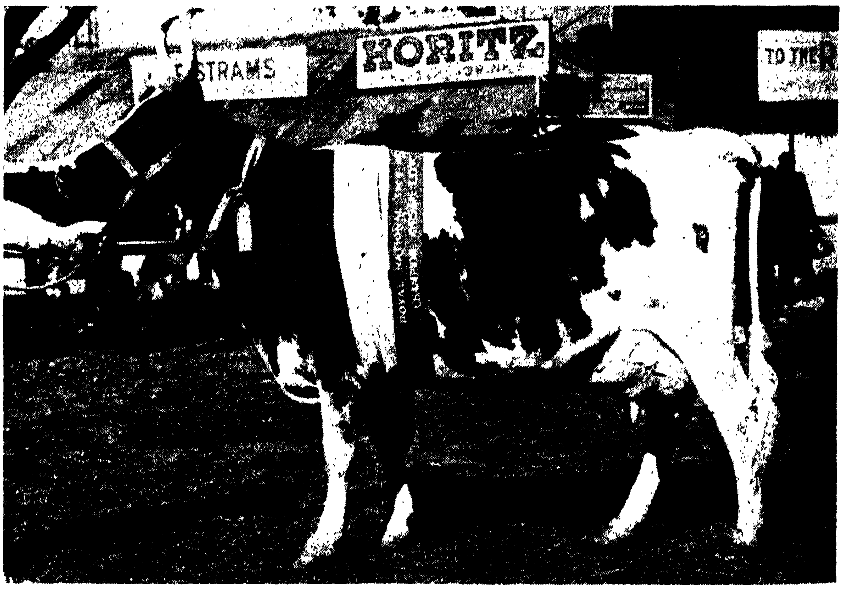


Plate 111.
CHAMPION AYRSHIRE COW.—"Crescent Farm Isabel 3rd." N. J. Mann.

MARKETING

Production Trends.

Good soaking rains fell in all dairying districts early in September, followed by some showery weather. Pastures have responded well to the rain and mild weather. Dairy cattle are in good condition, and in many herds the numbers of cows in milk are increasing, due to spring calvings.

Northern potato crops yielded well, and tubers reaching the Brisbane market are of excellent quality. Harvesting of the South Queensland crop is expected to commence towards the end of October.

On the Darling Downs, the early sown wheat crops made rapid growth under the mild conditions. The late sown crops are making excellent growth and give promise of a record yield. The early rains during the month came at a very opportune time and have been responsible for increasing the anticipated production of wheat to 10,000,000 bushels.

A considerable quantity of grain sorghum is still stored on farms. In all districts land is being prepared for new season's crop but, so far, only isolated areas have been planted.

All sugar mills are crushing, and in most districts sugar content is satisfactory. The Queensland estimate of 550,000 tons of sugar remains unchanged.

Proposed Potato Marketing Board.

The Executive Council has approved of the issue of a notice of intention to set up a Potato Marketing Board under the *Primary Producers' Organisation and Marketing Acts* consisting of five elected representatives of potato growers and the Director of Marketing or a deputy appointed by the Minister. The board will not be constituted, however, until potato growers are given an opportunity of requesting a ballot on the question. If a petition signed by not fewer than 100 growers is received within one month after the issue of the notice of intention, a vote of potato growers will be taken and the Board will not be set up unless 60 per cent. at least of those voting are in favour of the proposal.

The Commonwealth wartime marketing arrangements for potatoes will terminate next year, and discussions have taken place at various meetings of the Australian Agricultural Council in regard to the marketing of this crop. The scheme adopted by the Australian Agricultural Council provides for the setting up of potato marketing boards in each State under State legislation. Potato marketing boards have already been established in New South Wales, Victoria, and Western Australia. In Tasmania, a ballot of growers will be held in the near future to determine whether or not a board will be set up in that State.

Farm Mechanisation.

The trend throughout the world towards mechanisation of farming operations has shown a sharp rise during the last decade. This increased use of machinery during the war years made possible the harvesting of large crops at a time when limited labour was available. The Bureau of Agricultural Economics, U.S. Department of Agriculture ("The Agricultural Situation," June, 1947) published figures recently indicating that over two-thirds of present grain production in the United States will be harvested by combines compared with only one-quarter ten years ago. A nation-wide survey in 1945 showed that combines were used to harvest 80 per cent. of wheat, 40 per cent. of oats, 65 per cent. of barley, 50 per cent. of rye, 60 per cent. of flax seed, 35 per cent. of buckwheat, and 40 per cent. of rice.

GENERAL NOTES

Pullorum Disease in Poultry.

Blood tests of 200,000 head of poultry for pullorum disease were made by the Department of Agriculture and Stock in the course of the past 12 months; of that number, 4·8 per cent. gave positive reaction. This result shows no variance from that of tests made in the previous year; since then, however, the number of flocks tested has increased by about 25 per cent.

Pullorum disease is transmissible from carrier birds to chickens, and, if present, the death rate is high.

Birds free from the disease are being used for breeding during the present hatching season, thus reducing the risk of its occurrence among the chickens hatched.

Unfortunately, the nature of the disease is such that its presence cannot always be detected in the first blood test and subsequent tests are desirable. The continued co-operation of hatchery owners is therefore necessary before an assurance can be given that all chickens distributed from Queensland hatcheries are free from pullorum disease.

Groundsel is not Poisonous to Stock.

Groundsel bush is not poisonous to stock, according to results of feeding tests by the Department of Agriculture and Stock at the Animal Health Station, Yeerongpilly. The only ill effect observed was impaction; although cows may go off their milk after feeding on the weed. Groundsel has no fodder value and stock will eat it only when very hungry.

The Pig Industry.

In keeping with the outlook for increased production of pigs and improvement in the quality of pig meats, particularly where pig raising is combined with dairying and grain growing, the staff of the Pig Branch of the Department of Agriculture and Stock has been increased in the past two years.

In addition to the advisory staff stationed at Brisbane, advisers are now attached to the Burnett and the Atherton Tablelands districts. Mr. R. Grieve is located at Murgon, and Mr. T. Abel at Atherton.

Advice on the feeding, housing, breeding, and rearing of pigs for the home and export markets may be obtained from these officers or from the Pig Branch of the Department of Agriculture and Stock, Brisbane.

Chicken Sexing.

When the practice of determining the sex of day-old chickens became general, instances occurred where the cockerel chickens were sold as "day-old chicks." The purchasers, not being aware that the sex had been determined, sometimes bought with the expectation that there would be about an equal number of birds of each sex. Buyers are now protected under *The Poultry Industry Act of* 1946. Persons engaged in chick sexing are now required to pass a qualifying examination and to obtain a licence. It is obligatory on licensees to mark all chickens, determined as males, by spraying them with a violet stain. Buyers of chickens may, therefore, be sure that very few, if any, chickens carrying a violet stain are hens.

Water Blister of Pineapples.

A Proclamation has been issued under *The Diseases in Plants Acts* adding water blister of pineapples (*Ceratostomella Paradoxa*) to the list of diseases declared under these Acts. More effective control of the disease will now be possible under the supervision of inspectors of the Department of Agriculture and Stock.

Rural Topics

Milk Yield of Goats.

How much milk will a goat give? This is a commonly asked question. Whilst championship stud animals under test have yielded more than 5,000 lb. in a year, and gallon-a-day milkers are not uncommon, a good average grade animal, well fed and kept under good conditions, should yield apout 2 quarts per day over a lactation period of seven to ten months, states a departmental pamphlet. Goats, like cows, vary in their milk yield according to the breed, the individual within the breed and, what is most important, the feeding and general attention they receive.

Goats' milk is almost pure white in colour. It is a comparatively rich milk, intermediate in fat content between that of a Jersey cow and a Friesian cow, *i.e.*, containing approximately 5 per cent. The fat globules are small in size, and this, combined with a small curd, is said to make the milk more easily digestible and, therefore, very suitable for infants and invalids. It is claimed that goats' milk is digested in one-sixth of the time taken to digest cows' milk. Goats' milk can be used unsterilized, thus avoiding impoverishing the vitamin factor. This is possible by reason of the knowledge that tuberculosis in the goat is extremely rare. In Australia there appears to be no record of tuberculosis in goats.

The producers of goats' milk should remember, however, that goats' milk can readily become contaminated. It is, therefore, imperative that the utmost care should be given to keeping the goat stalls, pens, milking utensils, &c., scrupulously clean. Dirty premises and unattractive conditions ruin any milk business.

The following is an average analysis of goats' milk compared with other milks:—

——	Goat.	Ewe.	Cow.	Human.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Protein	4·06	5·37	4·48	1·52
Butter-fat	5·14	3·65	3·13	3·55
Sugar	5·28	5·46	4·77	6·50
Minerals	0·58	0·79	0·60	0·45
Total Solid Matter	15·06	15·27	12·98	12·02
Water	84·94	84·73	87·02	87·98
	100·00	100·00	100·00	100·00

Besides its value as a human food, goats' milk has been found especially valuable for feeding poultry, dogs, and calves.—*From an advisory pamphlet, New South Wales Department of Agriculture.*

Four Faults in Milking.

There are many points at which cream can be contaminated, and if his product is to be consistently graded "choicest" it is necessary for the farmer to be watchful at them all. Careless milking methods are a common cause of trouble. Second-grade taints may be introduced as a result of any of the following:—

1. Failing to wash the hands regularly and frequently while milking, and to change the water as soon as dirty.

2. Failure to wipe the cow's udder free of dust, mud and manure, and to wash the teats prior to milking, preferably with water to which a little hypochlorite has been added.

3. Using unclean cloths for the cow's udder, or dirty towels for the milker's hands.

4. Failing to reject the first few squirts of milk from each teat.

GADGETS AND WRINKLES

Insulating Iron Roofs with Sawdust Concrete.

In New Zealand, as in Australia, corrugated iron is the standard roofing material in rural districts, but it has the serious disadvantage that it gives very poor protection against changes of temperature. This fault is of considerable economic significance in relation to the housing of pigs, and as a means of improving the insulating qualities of iron roofs on pig houses in the Bay of Plenty district the laying of sawdust concrete over the iron has been tried.

Use for Old Iron.

Although the addition of sawdust concrete to an iron roof is chiefly to insulate it, it has the added advantage of enabling a durable and satisfactory job to be made of a roof using very old and rough iron such as has been used to cover stacks or has been through a fire.

Obviously the pitch of the roof must not be very steep or there will be difficulty in getting the concrete to stay in place while setting, but it is very unlikely that any farm buildings will have too steep a roof for this purpose.

Preparing the Roof.

Farm buildings do not, as a rule, have any superfluous timber in them, and although sawdust concrete is comparatively light, it is advisable to put in a few extra purlins under the roof—say at not more than 3 ft. centres—so that there will be little give or spring in the iron when it is being walked on while the concrete is being laid.

To prepare the roof for laying the concrete, set up a strip of boxing along each end of the roof so that it projects about half an inch above the highest lead-head nail in the roof. Unless the pitch is rather steep it is not necessary to put boxing at the front and back edges as the concrete should be stiff enough to lie there and be finished off with the float. The main purpose of the boxing at the ends is not so much to retain the concrete as to give a guide for screening down to a uniform thickness.

If the iron is old and battered any nail holes or cracks in the bottom of the corrugations should be stopped up with a black mastic putty. Then give the whole surface a brush over with a cement and water wash and let it dry.

The concrete is made with clean pinus insignis sawdust, preferably from the breaking-down saw—a rule which applies in all uses of sawdust for concrete. As there is no wear on the roof the mixture can be weaker than for a floor, and five parts of sawdust to one of cement is amply strong. In fact, the mixture has been made much weaker than this in the Bay of Plenty without any trouble, and it has been found that six parts of sawdust, two parts of clean sand, and one part of cement makes a satisfactory mixture.

Can be Put Down in One Operation.

Make the mix as dry as possible so that there will be no danger of surplus water flowing through it and carrying the cement away, and the whole thickness can be put down in one operation instead of in separate layers as is necessary with a thick sawdust concrete floor. Tamp the concrete down into the corrugations with the back of the spade and finish off the surface evenly by laying a screed along resting on the boxing strips at each end of the roof. If the roof is too long for this to be done, a strip of wood of the right width can be laid in one of the corrugations for the end of the screed to rest on, and the roof done in breaks of a convenient width.

If the concrete passes over a ridge it is advisable to lay a strip of fowl netting double on the iron down the ridge and work the concrete through and over it so that there is some reinforcing along the ridge. When the concrete is hard enough to walk on—in about three weeks in fair weather—dampen it and apply two coats of sand and cement paint to seal the surface against moisture. It is advisable to protect the new concrete from rain and essential to protect it from frost by covering with bags while it is setting, but do not re-wet it during the setting process, as is sometimes done with ordinary concrete.—From *The New Zealand Farmer.*

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BETWEEN TWO YEARS AND SIX.

What is a Healthy Child.

''But,'' says Billy's mother on her first visit to the Toddlers' Health Centre, ''I can't think Billy is sick just because he is thin and breathes through his mouth. He takes after my mother—she was always thin and she used to snore, too.''

''Joan has never had a doctor since she was born and I know she is not really sick,'' says another mother, ''but she's always been nervy and fussy about her food.''

As with many parents, here are two mothers who are puzzled because their toddlers do not measure up to the best standards of health and yet they cannot believe them to be sick.

On the other hand, too many parents are satisfied with a child that is ''not sick'' and excuse or explain away signs of ill health on often quite erroneous grounds.

The child who is ''not really sick'' is actually the same as the child who is ''not really well.''

Nothing but really healthy children should satisfy parents.

The healthy child has rosy cheeks and red lips. His eyes are bright. His skin is smooth and his body straight and strong with a good solid bony structure and firm, well-developed muscles. He grows taller and gains weight month by month. He is active, alert and interested in everything. He plays vigorously, creeping, running, jumping and climbing according to his age. His mother may find him a strenuous companion with his never-ending desire for activity. He is probably noisy and gets pleasure out of banging and shouting and singing.

He is hungry at mealtimes and needs no coaxing to persuade him to eat and when bedtime comes he pops straight off to sleep and sleeps like a log. His bowels move regularly and he does not complain of pains or aches. His teeth are clean and not decayed and his gums firm and pink.

How to keep a check on Health.

Intelligent parents want their child kept well. After all, if they have a motor car they have it checked over at regular intervals by a capable mechanic and thus avoid accidents and lengthen the life of the car. The machinery of the human body is just as much in need of regular inspection. The toddler's visit to the child health centre or to the doctor's consulting room should be made into an interesting excursion. Teach him to be proud of his weight card and his good

health report and his sound clean teeth. Tell him what sister or doctor will do, and why. A child should never be deceived about a visit to the doctor. It is foolish to tell him "The doctor isn't going to touch you" or "He won't make you take your clothes off"; and a mother who threatens to "call the doctor if you are not good" is a very senseless mother indeed. Watch for another toddler's article next month.

Further advice on this and other matters can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane* or by addressing letters "*Baby Clinic Brisbane.*" These letters need not be stamped.

Summer Fruit Drinks for Children.

Children are quick to acquire a taste for all manner of summer drinks, often to the detriment of their health. Many so-called orange and lemon drinks contain no fresh fruit at all, but are made from chemicals and artificial colouring matter. Not only do they not have the food value that the real fruit possesses, but they may be definitely injurious. The only drinks of this kind that the child should be permitted to have should be made from the fresh fruit juice.

Mothers who make real fruit juice drinks for their children will not be teased for artificial soda and other harmful drinks. Fruit juices not only satisfy thirst; the natural fruit acids they contain supply beneficial elements to the child's diet.

Pineapple Drink.—Wash the skin of a pineapple. Place in a lined saucepan with the core and enough cold water to cover. Cook slowly ¾ hour. Add 3 tablespoons or more sugar and the juice of 1 orange or lemon. Strain and allow to cool. Chill and serve.

Fruit Punch.—Take ½ cup lemon juice, 1 cup orange juice, grated rind ½ orange, 1 tablespoon grated lemon rind, 1 quart water, 3 or 4 cups sugar. Cook water and sugar for 3 minutes, cool and mix with orange and lemon juice, rind, &c. To this add the following ingredients:—(1) 1 quart ginger ale, ¼ cup preserved ginger cut up finely, (2) 1 cup grated pineapple, 1 pint soda water.

Fruit Cup.—Take 2 lemons, 1 quart boiling water, 2 oranges, 4 passionfruit, 1 ripe pear (if available), 4 tablespoons sugar, few drops cochineal. Wash lemon, peel thinly into a large jug or bowl; squeeze juice and place it in jug with rind and sugar; pour the boiling water over this and cover till cold. Strain into glass jug, colour very pale pink, add slices of oranges, passion-fruit pulp and cut pear or other fruit. Place in ice chest and serve very cold.

IN THE FARM KITCHEN.

Cheese and Celery Pie.

One small head of celery, about 3 heaped tablespoons grated cheese, 1 egg, ½ pint milk, pepper. Chop the celery and cook till tender in a very little salted water. Leave to get cold while you make some pastry, and line a tin or piedish with it. Put a piece of bread on the pastry to prevent it from rising, and bake in a moderate oven for about ten minutes. While it bakes, heat the milk in a saucepan, add the celery, most of the cheese, the egg and some pepper. Stir the mixture over a gentle heat until it thickens a little, and pour it into the pastry case (with the breadcrust removed). Sprinkle the rest of the cheese on top, and bake in a slow oven until it is set and nicely browned.

Fish au Gratin.

One pound cooked white fish, ½ pint white sauce, ¼ teaspoon salt, pinch of pepper and mustard, 1 oz. grated cheese, mashed potato, chopped parsley. Flake the fish into a well-greased casserole. Edge with mashed potato. Add seasoning and pour over the sauce. Sprinkle with browned breadcrumbs and cheese. Dot with small pieces of margarine. Bake in a quick oven for about 30 minutes.

Brandy Snaps.

Two ounces black treacle, or golden syrup, 2 oz. brown sugar, 2 oz. lard or dripping, 2 oz. flour, ½ teaspoon ground ginger. Melt the treacle or syrup, sugar and fat together. Sift in the flour and ginger. Drop teaspoons of this mixture on to a well-greased baking tin—well apart to allow for spreading—and bake for 15 minutes in a moderate oven. Remove from the oven, and while still warm roll around the handle of a wooden spoon.

QUEENSLAND WEATHER IN SEPTEMBER.

September of 1947 was an outstanding period of *phenomenally good over average rains* throughout the State, especially in the normally low seasonal rainfall areas of the Carpentaria and Western Border Divisions. A great deal of the Peninsula recorded 1- to over 2-inch rainfalls, and average district totals throughout ranged from 1½ to 3 inches; many areas received over 2 inches up to 315 points in the Central Highlands, 338 in the South Coast-Moreton, and 429 in the Port Curtis. The main rain periods were during the first week of the month and from the 25th to the 27th and during the latter days the drier sections in the East Carpentaria and Central Highlands to the Central and North Coast were benefited. The marked improvement in all pastoral and agricultural areas which started during August has been generally consolidated. Rain distribution was of the soaking type, promoting growth, and replenishing surface water supplies and starting reasonable stream flows inland. From Curraweva, Cooper's Creek for several days unusual seasonal stream heights of 4 feet 8 inches to 4 feet 9 inches were reported. A substantial part of the wheat area rain fell early in the month and good growing conditions have been maintained.

Pressure.—The production of the *near record to record September general rain distribution* was mainly due to the persistence of the rare early seasonal southward movement of warm tropical air. At the beginning of the month a well-defined trough formation in the Northern Territory and Western Queensland was connected with a vigorous closed curved depression in South Australia. The subsequent movement of this combination and the following cold front produced widespread rains in Eastern Australia. The southern centre moved rapidly across Tasmania but a shallow wave depression formed in Western Queensland on the 5th moving through the South-East of the State on the 6th. Fairly substantial continental light pressure controls followed, broken between the 14th and 16th by another trough and southern low general movement with rain activity mainly in the southern States. The rain period 26th to the 28th showed persistent tropical influences in an isobaric dip formation over Western Queensland penetrating a stable high pressure centre over the South-East of the Continent. Rain production was increased by weak cold front influence from the Central Interior high pressure ridge. With the southern high over New South Wales and the West Tasman Sea 25th to 28th, fresh to strong south-east winds to rather rough seas prevailed along the Queensland coast.

Temperatures.—Maximum temperatures were generally below normal, especially inland, ranging from 4.3 deg. below at Longreach to 5.9 deg. at Boulia and Mitchell. Minimum temperatures were mostly above normal 1 to 3 deg. from 0.4 deg. at Rockhampton to 4.6 at Georgetown. Palmerville had maximum readings over 90 deg. on 23 days—Normanton 21.

Cold to Frost Periods.—Stanthorpe registered screen temperatures under 40 deg. on 10 nights (9th-12th 17th-21st, and 24th) (lowest screen and grass minima 28deg/21 deg. on the 11th). Bybera 8 nights, 32 deg./21 deg. (11th).

Brisbane.—Pressure $\frac{9 + 3}{2}$ 30.103 inches (normal 30.050 inches).

Temperatures.—Mean maximum 74.0 deg. (normal 75.5 deg.) mean minimum 56.5 deg. (normal 54.8 deg.). Mean temperature 65.3 deg. (normal 65.1 deg.). Highest daily 81.1 deg. on 29th, lowest 47.0 deg. on 11th.

Rainfall.—293 points on 13 days. *Average* 198 *on 8 days. General Fogs*, 2 nights. *Fog Patches*, 8 nights.

The rainfall position is summarised below—

Division.	Normal Mean.	Mean September, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	13	66	408 above
Peninsula South	24	311	1,196 „
Lower Carpentaria	17	124	629 „
Upper Carpentaria	36	161	347 „
North Coast, Barron	92	160	74 „
North Coast, Herbert	155	416	169 „
Central Coast, East	108	189	75 „
Central Coast, West	70	203	190 „
Central Highlands	102	315	209 „
Central Lowlands	65	275	323 „
Upper Western	29	260	797 „
Lower Western	44	235	434 „
South Coast, Port Curtis	141	429	204 „
South Coast, Moreton	206	338	64 „
Darling Downs, East	167	256	53 „
Darling Downs, West	104	231	122 „
Maranoa	118	255	116 „
Warrego	88	196	123 „
Far South-West	56	197	252 „

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

NOVEMBER.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.59	6.5	Cairns	45	12	Longreach	42	28
6	4.55	6.9	Charleville.. ..	29	25	Quilpie	33	37
11	4.52	6.12	Cloncurry	61	38	Rockhampton ..	17	3
16	4.50	6.16	Cunnamulla ..	28	31	Roma	18	15
21	4.48	6.20	Dirranbandi ..	17	21	Townsville.. ..	37	12
26	4.47	6.24	Emerald	26	13	Winton	49	31
30	4.46	6.27	Hughenden ..	46	24	Warwick	3	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	8.43	6.27
2	9.50	7.17
3	10.53	8.13
4	11.51	9.16
5	..	10.23
	a.m.	
6	12.42	11.30
		p.m.
7	1.26	12.36
8	2.05	1.39
9	2.40	2.41
10	3.13	3.41
11	3.45	4.40
12	4.19	5.40
13	4.54	6.39
14	5.33	7.39
15	6.15	8.37
16	7.02	9.32
17	7.52	10.23
18	8.46	11.08
19	9.40	11.49
20	10.35	..
		a.m.
21	11.30	12.25
	p.m.	
22	12.25	12.58
23	1.19	1.29
24	2.15	2.00
25	3.12	2.30
26	4.13	3.02
27	5.17	3.38
28	6.24	4.19
29	7.33	5.06
30	8.41	6.01

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	11	28	26	43	0	19	28	51
6	12	27	27	43	1	18	29	51
11	21	15	38	31	12	7	43	35
16	30	9	45	24	20	0	53	26
21	25	13	42	28	17	2	49	31
26	14	23	30	39	5	14	34	44
30	9	30	25	44	0	20	26	53

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	7	49	36	63	20	49	7	41
3	3	55	34	67	18	52	4	45
5	9	51	37	64	21	50	8	43
7	13	43	39	59	24	45	12	36
9	24	31	46	52	31	37	21	27
11	34	21	54	44	38	29	29	18
13	44	10	61	37	45	23	37	10
15	52	4	66	33	50	19	43	5
17	55	3	68	32	51	18	45	4
19	52	8	66	36	50	21	43	8
21	44	11	61	38	45	23	37	11
23	34	21	54	44	38	29	29	18
25	24	31	46	52	31	37	21	27
27	14	42	39	59	24	44	13	36
30	3	53	34	66	18	51	4	44

Phases of the Moon.—Last Quarter, November 6th, 3.03 a.m.; New Moon, November 13th, 6.01 a.m.; First Quarter, November 21st, 7.44 a.m.; Full Moon, November 28th, 6.45 p.m.

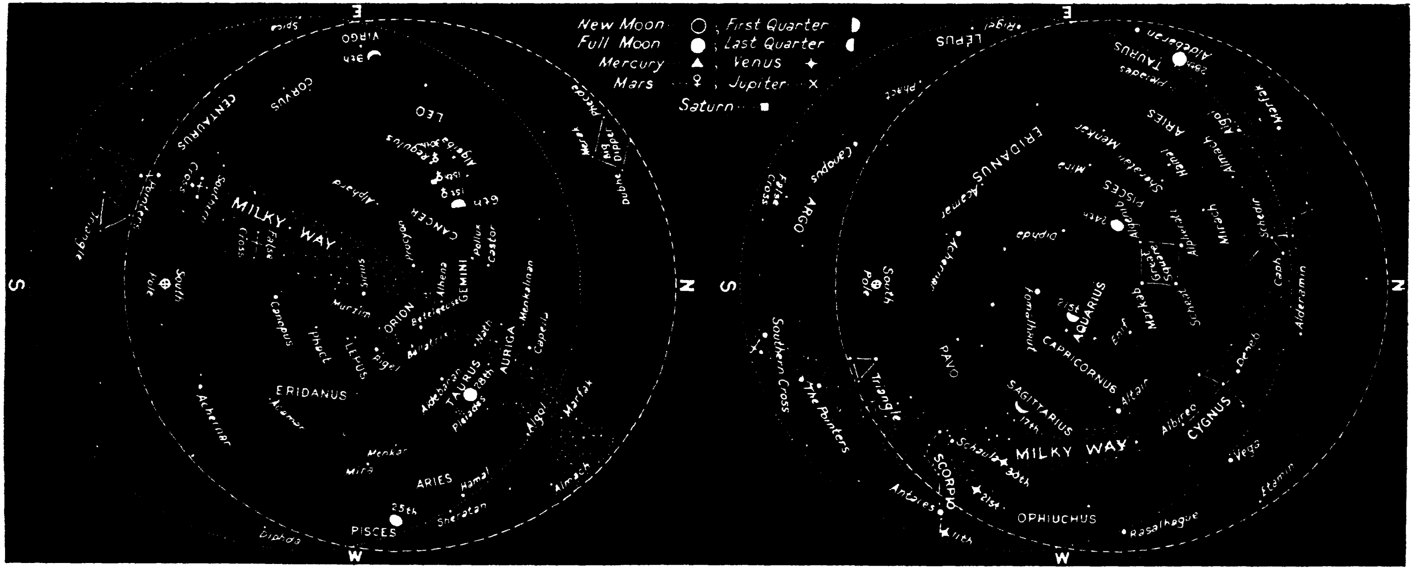
On November 15th the Sun will rise 20 degrees south of true east and true west respectively, and on November 10th and 24th the Moon will rise and set approximately at true east and true west.

On November 13th (Eastern Australian Date) there will be an annular eclipse of the Sun, but it will not be visible from Australia. The greater part of the earth from which it is visible is over the Pacific Ocean, but the path of annular phase also extends into South America. As a partial eclipse it may be seen from the western portion of North America and the northern portion of South America.

Mercury.—Will remain in the constellation of Libra all this month. At the beginning of November it will set about 50 minutes after the Sun, and on the 5th will be in conjunction with the Sun, when it will rise at sunrise and set at sunset; after which it will become a morning object and will reach its greatest angle west of the Sun on November 22nd, when it will rise about 1 hour before sunrise.

Venus.—At the beginning of the month, in the constellation of Libra will set 1 hour 10 minutes after the Sun. On the 9th in the constellation of Scorpio it will pass less than 1 degree to the south of Jupiter and by the end of the month will be a brilliant object in the western evening sky when it will set 1¼ hour after the Sun.

Mars.—This planet and Saturn are now in the same region of the sky. On the 1st Mars will rise between 1 a.m. and 2 a.m. and on the 11th will pass less than 1 degree to the north of Saturn while on the 27th it will pass 2 degrees to the north of Regulus.



Jupiter.—Now moving out of the evening sky. On the 1st it will set only about 2 hours after the Sun and by the end of the month will be too close in line with the Sun for observation.

Saturn.—At the beginning of November will rise between 1.15 a.m. and 2.15 a.m. and on the 30th will rise between 11.15 p.m. and 12.30 p.m. depending upon the place of observation within the State.

Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th November. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 8 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about 1 hour earlier than that time. The positions of the Moon and planets which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

SEPTEMBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' re-cords.	Sept. 1946.	Sept. 1947.		Sept.	No. of years' re-cords.	Sept. 1946.	Sept. 1947.
North Coast.	In.		In.	In.	*South Coast—cont.*	In.		In.	In.
Atherton	0·74	42	Nil	6·39	Gatton College ..	1·43	44	5·20	..
Cairns	1·65	61	0·09	2·92	Gayndah	1·47	72	2·23	4·26
Cardwell	1·47	71	Nil	5·92	Gympie	2·02	73	1·48	3·45
Cooktown	0·56	67	0·01	0·58	Kilkivan	1·61	62	0·96	3·39
Herberton	0·55	57	Nil	1·30	Maryborough ..	1·84	72	0·76	4·53
Ingham	1·51	51	0·52	3·09	Nambour	2·26	47	3·25	5·07
Innisfail	3·52	62	0·11	7·22	Nanango	1·71	61	2·19	2·48
Mossman	1·93	19	0·24	5·21	Rockhampton ..	1·22	72	1·23	3·92
Townsville	0·70	72	0·01	2·62	Woodford	2·04	55	3·06	3·07
Central Coast.					*Darling Downs.*				
Ayr	1·21	56	Nil	2·49	Dalby	1·61	73	1·64	2·27
Bowen	0·77	72	Nil	1·04	Emu Vale	1·66	47	3·85	2·82
Charters Towers ..	0·75	61	Nil	2·32	Jimbour	1·52	64	1·64	2·15
Mackay	1·60	72	0·12	1·26	Miles	1·26	58	1·72	3·18
Proserpine	1·89	40	0·09	4·26	Stanthorpe	2·19	70	4·47	3·05
St. Lawrence ..	1·19	72	0·32	1·81	Toowoomba	2·01	71	4·42	3·82
					Warwick	1·75	78	4·49	2·73
South Coast.									
Biggenden	1·38	44	1·13	3·64	*Maranoa.*				
Bundaberg	1·48	60	1·08	5·56	Roma	1·32	69	0·84	2·69
Brisbane Bureau ..	1·98	95	3·67	2·93	St. George	1·03	62	2·29	2·50
Caboolture	1·76	67	3·96	3·49					
Childers	1·64	48	0·71	4·85	*Central Highlands.*				
Crohamhurst.. ..	2·49	50	3·23	3·87	Clermont	0·95	72	0·01	3·26
Esk	1·94	56	4·26	2·67	Springsure	1·22	74	0·23	3·54

CLIMATOLOGICAL DATA FOR SEPTEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	82	67	86	16, 19, 30	62	1, 2, 10, 12	292	9
Herberton	..	76	57	83	6	50	1, 10	130	5
Townsville	..	81	66	83	18	56	10	262	6
Rockhampton	30·12	78	59	90	30	49	10	392	10
Brisbane	30·15	74	57	82	29	47	11	293	13
Darling Downs.									
Dalby	..	73	48	84	30	37	10, 11	227	7
Stanthorpe	..	67	42	79	14	28	11	305	8
Toowoomba	..	69	48	78	29	40	4, 11, 18	382	9
Mid-Interior.									
Georgetown	30·06	90	66	95	14	58	1, 10	145	2
Longreach	30·12	81	52	93	30	40	17	260	8
Mitchell	30·13	72	49	87	30	37	10	299	8
Western.									
Burketown	..	88	65	96	21	58	19	93	4
Boulia	30·05	80	59	98	30	50	9, 18	125	5
Thargomindah	30·10	74	54	90	30	45	10	47	2

A. S. RICHARDS,
Deputy Director, Meteorological Services.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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Contents

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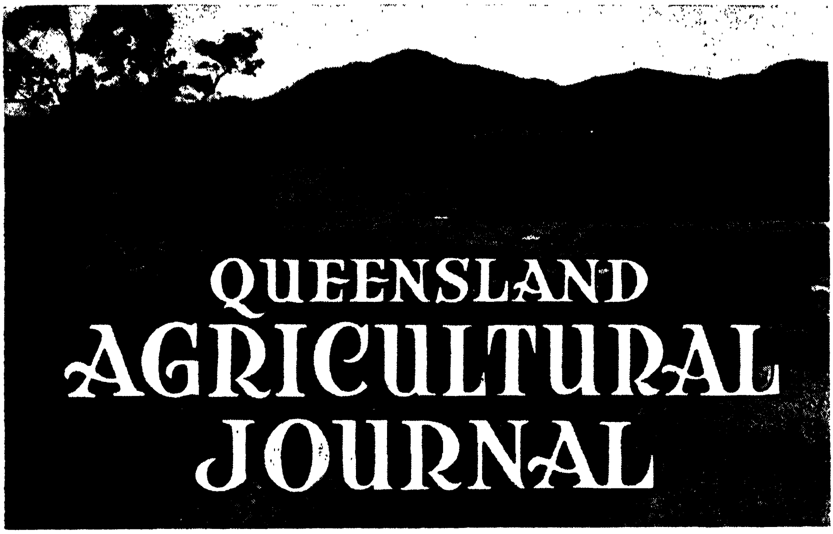

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Event and Comment.

Queensland Prize Beef Praised.

IN a letter to the Premier, Hon. E. M. Hanlon, the Agent General for Queensland in London (Mr. L. H. Pike) writes of the high quality of a consignment of Queensland beef exhibited at Smithfield recently. "The beef," says Mr. Pike, "which was from prize-winning cattle at the Gladstone (Queensland) Fat Stock Show, certainly proved an excellent run of real butcher's meat; the quarters were of very good quality, of an ideal weight and finish, while the butchering and dressing were perfect. It had been prepared and shipped in the *Port Phillip* by Swift (Australian) Company, Pty., Ltd., and its condition was excellent: in actual fact there was little doubt it was perhaps the best consignment of Australian beef seen in Smithfield.

"This display, which consisted of 311 quarters and represented approximately 52,000 rations, was sponsored by the Australian Meat Board to mark the generous action of the exhibitors, Port Curtis graziers and the people of Gladstone, in donating the whole of the fat cattle exhibited at their recent show to the Aid for Britain Appeal."

Considerable interest was aroused in this display and among the many distinguished visitors were Mr. John Strachey (Minister for Food), Mr. J. Beasley (High Commissioner for Australia), Mr. L. H. Pike (Agent General for Queensland), Sir Charles McCann (Agent General for South Australia), Mr. P. Newcomen (United Graziers' Federal Council of Australia, Capt. R. H. Heywood (London Representative of the Australian Meat Board) and Mr. Fred. Paul (President,

Meat and Allied Trades Federation of Australia). Mr. Strachey took the opportunity of expressing Britain's thanks for this generous gift and added that his Ministry was having discussions with the Australian High Commissioner and other representatives of Australia with a view to increasing Anglo-Australian trade.

Tobacco and Cotton.

As stated in the Annual Report of the Department of Agriculture and Stock, tobacco and cotton are two Queensland-grown crops the production of which still falls far short of meeting Australia's domestic requirements. In view of this fact the Department in the past has given much attention to the investigation of problems associated with the growing of these two crops. During 1946 the work on tobacco was extended to include exploratory plots in the Burdekin River district. The results obtained on these plots were very promising and a more extensive programme for the Burdekin district in 1947 was drafted accordingly, the crops to be grown and harvested before the onset of the heavy rains of summer. One of these experiments—at Home Hill—is being carried out in co-operation with the Council for Scientific and Industrial Research. The other Burdekin River tobacco experiment, situated at Clare, is a purely departmental one and is duplicated at Abergowrie on the Herbert River, a coastal district in which the outlook for tobacco is also promising, provided it is grown during the spring and early summer months.

Another development in tobacco experimental work to which reference is made was the decision by the Federal Government to make available—through the Department of Commerce and Agriculture—a grant of £10,000 per annum for five years to the States of Queensland, New South Wales, Victoria, and Western Australia for the purpose of carrying out additional experimental and demonstration work in tobacco production. Queensland's share of this grant is £3,750 per annum, which must be expended by the State on a pound-for-pound basis on new tobacco projects. The way in which these funds might be spent most profitably was the subject of much discussion at a week's conference of departmental tobacco officers in Brisbane. The purpose of this conference was to review the status of the industry in Queensland, to assess the nature and the relative importance of the problems to be overcome before the industry could be thoroughly stabilized and expanded, and to prepare suggestions as to how these problems could be tackled most effectively.

The other crop for which there is still a large unsatisfied local market is cotton, and here again the Department has been assiduous in obtaining the information required by the farmer to guide him in the actual growing of the crop. This has largely been obtained over a series of years at the Biloela Regional Experiment Station which, at its inception in 1925, was devoted exclusively to cotton experimental work. At first the programme at this centre was restricted to experiments on rain-grown cotton but, in later years, work with crops produced under irrigation has been done at Biloela, because it has been obvious for some time that cotton may merit serious consideration in the cropping programme of some of the areas on which irrigation facilities are likely to be developed in the near future.

Some Administrative Aspects of Irrigation.*

ARTHUR F. BELL.

IN a report on "Irrigation, Water Conservation and Land Drainage" presented to the Commonwealth Government in December, 1945, the Rural Reconstruction Commission states, "The Commission accepts the view that *water will ultimately be one of the most important of all commodities in the Australian economy.*" In summarising their conclusions on the availability of water the Commissioners further say: "The possibilities of increasing Australia's irrigated acreage, although considerable, are not as great as is popularly supposed. Ultimately, shortage of water will be the greatest of the obstacles to increased population. For this reason, and because the allocation of the water of a catchment once made cannot easily be changed, it is desirable that the use of the available waters should be carefully planned and that irrigation should be given priority over electricity generation."

The recent—and, in some areas, the still-current—disastrous drought has inevitably turned the thoughts of Queenslanders towards irrigation. While this interest has waned with the coming of relief rains, it nevertheless does appear that the trials of the past two years have awakened a lasting public consciousness of the pressing necessity for development of our water resources. Queensland, in common with its sister States, is a land of deficient and uncertain rainfall,† and our agriculture is to a marked extent adversely influenced by the vagaries of climate. Since the progress of this State is so intimately integrated with primary production, it follows that stability will be attained only to the degree that primary production is stabilised by the widespread development of irrigation and of practices designed to ensure a better exploitation of our summer rainfall.

Previous papers presented to this Society on the subject of irrigation have dealt mainly with the field technique of water application and its effects on soils and crop yields. The purpose of this paper is to present some observations on the investigations, planning, and administrative work which must precede and accompany the successful launching of an irrigation "scheme." There exists a great deal of misconception regarding the practicability and cost of irrigation schemes and their

* Paper presented at Innisfail Conference, Q.S.S.C.T., May, 1947.

† The Irrigation Department has recently compiled and published a series of graphs which clearly illustrate this factor of unreliability.

effects on the community, the availability of water for irrigation, the volume of reservoir storage required, and the losses of water in storage and in transit to the fields. As I commence to write, I note that the quotation for the day on my desk calendar is, "Getting rid of a delusion makes us wiser than getting hold of a truth"; it is hoped that this paper may both dispel some delusions and submit some truths.

Sources of Water for Irrigation.

Irrigation water may be obtained from three ultimate sources: (*a*) from wells and bores which reach underground water-bearing strata or aquifers; (*b*) from reservoirs created by dams or weirs thrown across streams and impounding the water of those streams and their tributaries; (*c*) from natural unregulated streams. All three sources are widely exploited, the lastnamed being the least important since the water available is least in time of drought when the need is greatest.

This State is fairly well served by underground water supplies and further investigation might well show that it is, in fact, very well served; in this respect its resources appear to be much greater than is the case in the other States of the Commonwealth. The advantages of subsurface water are that it can be used for irrigation right at the source of supply; no costly headworks and reticulation channels are necessary; there is no loss of water from storage by evaporation; and pumping from the wells facilitates the use of sprays which bring about economy in water usage. Whereas surface water storage facilities may take years to plan and construct, subsurface water can be used immediately a source of power is available for pumping from wells. Rural electrification with cheap power can therefore play an immediate and important part in increasing the area under irrigation—as has been so well demonstrated in the development of 20,000 acres of irrigated crops in the Lockyer Valley during the past decade. In the sugar industry the intensive development of the Burdekin delta is a striking example of successful large-scale irrigation with subsurface water.

The quality of subsurface water is naturally inferior to surface water; greater care is necessary in its use, and research is required to anticipate the soil problems which will certainly arise where well water is used. Such water must always be pumped, whereas stored surface water is usually delivered to farms by gravitation; in view of the cost of this pumping, subsurface water is generally used only for the production of higher-value crops. With these qualifications, the development of our underground water resources can play a very important part in the stabilisation of agriculture in Queensland. The distribution and extent of suitable subsurface water have not by any means been fully established, and a comprehensive State-wide boring survey of these resources would amply repay the expense involved.

In some contrast, Queensland is for the most part poorly endowed in the factors which favour the development of large-scale surface-storage irrigation schemes. The rainfall over most of the State is relatively low, poorly distributed, and uncertain, resulting both in a small run-off into reservoirs and the necessity for large storages to carry water supplies over long periods of drought. The main "dividing" range is close to the coast so that streams in the heavier rainfall areas are relatively short, with steep gradients. There are no snow-capped mountains to store water in the winter and to regulate stream flow in

spring and early summer. The country is geologically old, so that mountain ranges are low and there is a great lack of deep narrow-mouthed gorges for use as storage reservoirs. The evaporation rate is high, ranging from about four feet per annum in the south-east, to perhaps ten feet in the north-west; the annual loss by evaporation of the top five or six feet of water is obviously a serious matter in broad shallow reservoirs.

Availability of Water.

In respect of common misconceptions, it is in the visualisation of available water that advocates of particular irrigation schemes are liable to go most astray. People are naturally apt to be misled by the sight of flood waters if they do not bear in mind that the waters have been drawn from a vast area and that the flood actually covers a small proportion of that area. The bulk of Queensland's good agricultural land lies in the 25 to 30 inch rainfall zone and stream gaugings show that under these conditions the average run-off of rainfall is about four per cent. or *only about one inch per year.* Naturally this figure varies a good deal in particular areas according to topography, type of vegetation, and intensity of storms, but overall the figure is a good enough approximation. In the Condamine River basin on the Darling Downs, for example, the amount of water which ultimately finds its way into the Downs section of the stream is equivalent to less than one inch of rain over that part of the catchment area per year.

The rest of the rainfall percolates down through the soil to lower levels, evaporates from small pools and from the soil surface, or is used up in the transpiration activities of plants. In Victoria, where rivers have been intensively gauged, it has been computed that if all the water in all the streams were impounded it would not constitute more than five per cent. of the annual rainfall.

As rainfall rises above the 25-30 inch bracket, the percentage of run-off increases rapidly: It has been calculated, for example, that of the 61 inch mean annual rainfall of the Barron River catchment area above Picnic Crossing, 25 inches or 41 per cent. runs off in the Barron and its tributaries; corresponding figures for the Tully basin are 92 inches and 56 inches or 61 per cent. However, due to the proximity of the coastal range to the sea, the catchment areas of coastal rivers in the high-rainfall zone are small, and over the greater part of Queensland the average run-off is less than one inch.

Before considering any surface storage irrigation proposal in detail, therefore, it is necessary to have access to stream gaugings in order to determine the quantity of water which will be available for storage. This involves a knowledge not only of average annual stream discharge, but also of its distribution and minimum discharge rates. Stream gaugings made on the Condamine below Warwick by the Irrigation Department indicate that the average annual stream flow over a period of 15 years was 45,500 acre feet, but this fluctuated between 100,000 acre feet in 1927-8 and 14,000 acre feet in 1932-3. Moreover, the minimum discharge of 14,000 acre feet was immediately preceded by the sub-average discharge of 32,000 acre feet. The catchment area involved is about 1,150 square miles, or nearly 750,000 acres. Obviously, any irrigation project involving the full capacity of this river will, to be quite safe, have to provide for the storage of about two years' supply of water—and to restrict the area which can be irrigated.

Siting of Irrigation Works.

Should the study of rainfall and stream-gauging records indicate the availability of a reasonable volume of water, it then becomes necessary to seek a site, for the construction of a dam, which will be suitable both as to topography and foundations. Contour surveys must also be carried out in order to determine the capacity of the proposed reservoir at different heights and also, and this is important, determine the area which would be submerged. As emphasised earlier, the smooth topography of much of Queensland does not make for good dam sites and it is possible for the contour surveys to show that, say, 3,000 acres of good river-flat land would have to be submerged to store sufficient water to irrigate 5,000 acres. Compensation for the loss of the submerged land would in such case add a serious burden to the capital costs per acre irrigated.

Having determined the site, capacity, rate of replenishment, and approximate cost of a dam of given height, it is necessary to determine whether land of required topography, texture, and fertility is suitably situated for irrigation from the reservoir. In the past many irrigation settlements have been established only to fail through unsuitability of the soil or its drainage. Irrigation and drainage are complementary and, if success is to be assured, they must be planned and established concurrently on the basis of intensive soil surveys. In the Murrumbidgee Irrigation Areas, some 6,000 acres of citrus orchard, with an annual productive capacity of well over £100 per acre, were reported in 1943 to be in a serious state if ill-health. Investigation showed that this was due to poor drainage caused by "pockets" in the sub-strata which had become water-logged during continued irrigation and particularly as a result of the heavy irrigation of the wartime increased rice plantings.

It is a basic rule in irrigation that water should be used as near as possible to the source of storage in order to minimise wastage through seepage and evaporation. Careful determinations made by the Victorian State Rivers and Water Supply Commission show that of the water which is released from the reservoirs of that State, only about one-third actually reaches the fields; the rest is lost by leakage, seepage, evaporation, and the maintenance of riparian rights. If we add to this the evaporation and seepage losses in the reservoirs themselves, it will be seen that stored water is far from being delivered water. (As a matter of passing interest, it may be noted that non-observance of this basic rule is one of the defects of the so-called Bradfield Scheme for the diversion of coastal waters of North Queensland to the western part of the State.)

In order, finally, to drive home this matter of water availability, it might be instructive here to make a simple back calculation: Suppose we wish to irrigate 5,000 acres, and that we propose to give it supplementary irrigation to the extent of one and a-half feet per acre, or a total of 7,500 acre feet of water per year. On the basis of Victorian experience of water loss, this would entail the delivery from the reservoir of 22,500 acre feet, and allowing for reservoir losses, the storage of, say, 25,000 acre feet. But our rainfall is so erratic in many places that we would have to store two years' supply to leave a reasonable margin of safety, bringing the total required storage to 50,000 acre feet. Let us assume that the catchment area is in the 25-30 inch rainfall zone and that the annual run-off is one

inch; then if we wish to fill the reservoir in an average year a catchment area of 600,000 acres would be required. In other words, a catchment of 120 acres would under these conditions supply the water for the irrigation of only one acre.

It is true that in Victoria a good deal of the irrigable land is situated very considerable distances from the storage reservoirs and that, with careful planning, we should be able to reduce these distances in Queensland; at the same time, however, our average evaporation rates and possibly our seepage rates per mile will be higher. It must therefore be accepted that we shall never be able to irrigate a very great proportion of the agricultural lands of Queensland.

Sponsors of irrigation projects often advance in favour of their proposals the suggestion that flood prevention and power for the generation of electricity will also be achieved. In practice conservation of water for irrigation is largely incompatible with flood prevention and hydroelectric schemes. The fundamental requirements for irrigation and flood prevention are diametrically opposed, since the irrigator's object is to keep the reservoir full, while for flood prevention the object is to keep it empty. Some compromise can no doubt be effected in areas of reliable seasonable rainfall, the reservoir being lowered just prior to the expected onset of the wet season. The generation of electricity for industry requires a steady round-the-year discharge of water from the reservoir whereas irrigation requirements aim at conservation in rainy periods for release during dry periods; at the same time, intermittent generation of power from an irrigation reservoir discharge can be used in subsequent pumping of the same water to the field.

Maintenance of Irrigation Works.

The physical administrative problems associated with surface-storage irrigation schemes do not cease with the construction of the dam and the excavation of distribution and drainage channels. Obviously no scheme could be designed to supply all irrigators on the same day, and complex systems of rotational delivery must be worked out and enforced. Steps must also be taken to see that only the stipulated quantities of water are drawn from the distribution channels. In most places it has been found necessary to provide that water will not be delivered unless the farmer has graded his land and has a suitable system of delivery ditches.

The likelihood of siltation of reservoirs is an ever-present problem. Sites for reservoirs are few and generally irreplaceable, so that if a reservoir becomes silted there can be no question of moving on elsewhere. The protection of watersheds against the soil erosion which causes siltation of reservoirs must henceforth engage the very serious attention of irrigation authorities, backed by comprehensive statutory powers where necessary. Senseless felling of trees, indiscriminate burning of vegetation, carelessly caused bushfires, and wrongful land use combine to increase erosion and siltation. One of the oldest reservoirs in Australia, the Laanecoorie on the Loddon River, had a capacity of 14,000 acre feet when constructed in 1892; fifty years later siltation had reduced the capacity to less than half. Following the destruction of ground cover by the disastrous Victorian bushfires of 1937, about 1,000 acre feet of silt was deposited in the Eildon Reservoir during the succeeding twelve months.

Minor Storages.

What has been said in the foregoing pages in relation to large-scale surface storage applies, in less degree, to minor surface storages effected by the construction of weirs within streams. Fixed weirs are usually between ten and twenty feet high, their height being limited by the dangers of flooding caused by impeding the flow of the channel. The primary function of weirs is stream regulation and they are widely used in conjunction with large reservoirs for this sole purpose. However, when constructed in streams which are more or less perennial, single or multiple weirs may have great value in the absence of reservoirs, as has been amply demonstrated in this State. In these circumstances, they act much in the same way as a car battery, being continuously recharged. Since storage is within the confines of the stream only, the cubic capacity of weir storage is not great and is not usually more than a very few hundred acre feet. As the cost of a weir may be well in excess of £100 per acre foot of storage capacity they are not, as a rule, economic propositions on streams which run for only short periods; exceptions may be found in the case of deep watercourses of low gradient, where water is required for the production of high-value crops such as vegetables.

Control of Water.

The Department of Irrigation licenses all artesian bores, and all sub-artesian bores in the artesian basin, but up to the present there has been little need for the exercise of administrative control of sub-surface irrigation waters. However, most irrigators will agree that in areas where supplies become limited, there should be some measure of control to prevent wastage, or extravagant use of water. It is also becoming evident that the extent of the underground water resources should be determined before development in any particular area is permitted to go very far. Although they have not hitherto been treated as of equal importance the determination of volume of storage and rate of replenishment should be regarded as just as important for subsurface as for surface-storage irrigation schemes. There is inevitably a strict limit to the volume of underground water available to any one area, and to the annual replenishment of that water; if these are disregarded there must be some bad crashes in dry years if farmers are permitted to extend irrigation and pump indiscriminately. Irrigation from wells close to the coast has the added danger of encroachment of salt water if water tables are lowered by over-pumping.

In this connection a very interesting investigation is now being carried out in the Lockyer Valley for the Bureau of Investigation of Land and Water Resources. Following reticulation of cheap electric power in this valley some ten years ago, irrigation developed, and is still developing, rapidly. The question arose as to whether the volume of the water in the aquifers, and the wet season replenishment of their annual loss of water, were sufficient to permit continued expansion at this rate. Over the past two years a large number of borings have been made down to the sandstone bottom of the valley so as to furnish some idea of the volume of the aquifer. Over the same period a surveyor's level datum point has been placed on all wells and the standing water levels of a representative number have been read at selected intervals. From these borings some idea has been obtained of the probable volume of the aquifer, while the series

of water level readings has shown that the rate of replenishment of this underground reservoir is such that further expansion of irrigation may be confidently encouraged. It might be mentioned in passing, that the borings also revealed the past existence of an old river which flowed under the bed of Lockyer Creek and which was larger than any of our existing rivers.

Economic Considerations.

Thus far we have concerned ourselves only with the physical problems of construction, supply, and distribution of irrigation works and water. There are, however, the equally important administrative questions of finance, economics, and social effects.

It has been generally accepted by people and their Governments that an irrigation scheme, like a highway, is a national asset benefiting the community and as such entitled to a measure of national financial assistance. Consequently we find an increasing tendency for the nation to assume a considerable proportion of the cost of construction of headworks for surface storage and main distribution channels. The remaining cost is frequently met by a special rating on the benefited urban and rural areas plus, of course, a charge applied to the direct beneficiaries—the actual users of the water.

Construction of headworks and reticulation channels involves the expenditure of very large sums of money and cannot be entered upon by Governments or other institutions without a full survey of costs, probable returns, and economic effects, and also of the relative degree of urgency or priority. It will readily be appreciated that capital expenditure can soon rise to a level out of proportion to the value of the land; a dam to store the water necessary to irrigate six or seven thousand acres might easily cost £1,000,000 plus the cost of delivery channels, resumption of submerged land, adjustments to roads and bridges, and so on. The probable use of the land must also be considered when assessing a proposal; for example, water used for the irrigation of tobacco could carry a cost perhaps ten times that which could be paid for water used for producing fodder for cattle.

Social Effects.

Irrigation may have one or both of two objects: (*a*) stabilisation of production, and (*b*) increased production. In prewar days most of the cash crops grown in Queensland were already produced to the limit of their available markets, the notable exceptions being cotton and tobacco. To increase the production of crops with already saturated markets can only lead to chaos; the object of irrigation in these cases should be that of stabilisation by the elimination of alternate gluts and famines. Insurance of crops by irrigation enables planned production, the stabilisation of prices, income, and labour requirements; and should generally reflect itself in a more prosperous and happier community. Moreover, irrigation, by causing the more intensive use of land, brings closer settlement with improved communications, better schools, and better amenities generally.

In submitting proposals for various localities their sponsors do not usually give consideration to the repercussions which their adoption would have in other areas, but the authorities who examine the proposals

must necessarily do so when the expenditure of public money is involved. For example, the country's requirements of, say, peanuts, might be grown in Zone "A," a dry farming zone. The citizens of Zone "B" in advancing their claim for an irrigation works might point out that with irrigation they could diversify their farming and, amongst other things, grow peanuts in great abundance. The question then arises as to how far public money should be spent to provide Zone "B" with an irrigation project which will put Zone "A" farmers out of business. The large-scale development of irrigation bristles with problems like this, and there seems little doubt that as it expands some sort of crop assignment system will have to be worked out.

There are, of course, strict limitations to the degree to which irrigation will effect either increase or stabilisation in primary production. Even though the State, and the general ratepayers of a benefited area, bear a large proportion of the capital costs of irrigation schemes, the "per acre" value of a wheat crop for example, is too low to warrant irrigation under the most favourable conditions. Perhaps it is as well, for these crops require broad acres and there is so much land to which irrigation water can never be brought.

Among major crops for which the visible market is far from saturated we have mentioned cotton and tobacco; but the most important in Australia is undoubtedly fodder, not for immediate sale but for direct feeding to animals. As far as one may judge, an unlimited world market for high quality meat will be available indefinitely if we bestir ourselves to export to its requirements. The development of large areas of irrigated pastures would enable us to produce enormous quantities of high grade lamb and beef, and, what is of paramount importance, would enable continuity of supply. We cannot hope to play a leading part in the chilled beef trade if we are limited to fluctuating seasonal exports. The status of our large dairying and adjunct industries would also be immeasurably improved by the widespread production of irrigated fodder.

By far the greatest development of irrigation in Australia has taken place in Victoria, and it is of interest to note that of 600,000 acres annually under irrigation in that State, 550,000 are devoted to fodder production, mainly as permanent pastures. It seems definite, therefore, that the planning of irrigation in Queensland must contemplate emphasis on animal production.

Conclusion.

The foregoing is a fairly cursory survey of the problems which confront planners and administrators of irrigation schemes. Some of these problems are considerable, but they can all be met; reflection on them should engender discrimination, but not pessimism.

The amount of money which any State can spend annually on irrigation is limited, so that schemes must be put into operation in the order of their productivity, urgency, and feasibility; that any particular proposal is a sound one is thus not sufficient to justify its immediate implementation. There are many economic and technical engineering and agricultural reasons why fair-sized schemes may be preferable to dispersed small schemes. Nevertheless, we should be careful not to err in the opposite direction; a £40,000,000 scheme

holds the imagination, but ten £4,000,000 well-distributed schemes would be better for the State—and some of them would be in production years before a gigantic scheme could be completed.

In this dry country our goal must be the conservation of every drop of water which would otherwise run to waste and we should pursue that goal with all the energy and resources at our command. At the same time, we must maintain a realistic attitude; the green fields of irrigated areas have an emotional appeal and grandiose schemes are often propounded without much knowledge or restraint. Mistakes in irrigation often cannot be rectified, so that sound planning must accompany energy, enterprise, and courage in the development of this priceless asset, water, for which there is no substitute.

The Weed Problem.*

W. J. S. SLOAN.

Introduction.

A WEED is commonly defined as a plant growing "out of place." Most weeds are useless, some are poisonous to stock, others may harbour plant diseases and pests, while a few are actually parasitic on economic crops; for example, the cane-killing weed (*Striga* spp.). Some plants, which in their proper place are useful, become weeds when they grow amongst other crops where their presence is not desired. For instance, leguminous cover crops are very necessary and useful in the cane rotation, but volunteer plants coming up in the plant and ratoon cane are unwanted and classed as weeds, particularly if the legume concerned has a twining habit of growth such as to interfere with the normal harvest of cane.

Ever since man began to cultivate patches of plants for domestic use, the problem of weed control has been a real one. If unchecked, weeds may add considerably to the difficulties of seed bed preparation, may lower yields and hinder harvesting. Their effective and economic control should be the aim of every efficient farmer, whether he grows cane or any other crop, for weed control can be a prominent item in costs of production. Methods of control have steadily improved, but the need for even better methods still stimulates the ingenuity of farmers, engineers, and chemists, and large industries have been built up to provide the machines required for this purpose in modern agriculture. Weed control by introduced insect parasites has achieved success in some cases, but the cane farmer can expect no assistance in this direction for solving the weed problems in cane fields. Despite much intensive research many difficult weed problems still remain, and there can be no relaxation in investigations to solve them.

In Queensland there is a wide variety of weed species infesting cane lands, but the most important species and those most difficult to handle belong to the grass family, including summer grass (*Digitaria adscendens,* and other species), common couch grass (*Cynodon*

* Paper presented at the Innisfail Conference, Q.S.S.C.T., May, 1947.

dactylon), and Guinea grass (*Panicum maximum*), while nut grass (*Cyperus rotundus*) is well established in a number of areas. Most common weeds are able to survive and grow under conditions of high and low temperatures and can resist drought to a remarkable degree. Species such as summer grass, red pigweed (*Portulaca oleracea*), black pigweed (*Trianthema portulacastrum*), goat weed or Mother Brinkly (*Ageratum conyzoides*), and many others produce enormous numbers of seeds and multiply and spread rapidly, particularly in warm weather when soil moisture is good.

Hand hoeing and the use of cultivation implements, which have steadily improved in quality and variety over the years, constitute the main method of control at the disposal of farmers. Spraying with weedicides has received limited attention, while a new method of control advocated in recent years is the use of "flaming machines" to burn and kill the weeds on the surface of the ground without injuring the cultivated crop. Mechanisation of cultivation equipment has helped considerably to reduce the labour problem and has greatly speeded up operations, enabling weeds to be attacked more readily at the right stage of growth, and fields to be covered more rapidly than was possible formerly with horse-drawn implements.

WEED CONTROL BY CULTIVATION.

Crop rotation, efficient seed bed preparation, the judicious use of implements for inter-row cultivation and, to some extent, hand hoeing are all necessary for effective economic control of weed growth.

Crop rotation is valuable from many points of view, and not the least important is the influence on weed populations. It is common experience that land, freshly cultivated after being under grass sod for several years, develops less weed growth, and requires less inter-row cultivation. The weeds die more easily after cultivation because the friable soil falls away more readily from the weed roots than is the case in old cultivations. The need for laying down land to a sod grass crop for several years at regular intervals to improve soil structure, has been recognised for a long time, and it is obvious that in many of our sugar lands such a rotation must receive attention in the future.

Good ploughing is necessary for the burial and destruction of weed growth, especially of deep-rooted weeds, and for the preparation of a mellow seed bed to facilitate row planting and inter-row cultivation. In soils deficient in humus, good ploughing is particularly important for the creation of good planting tilth. The soil granulating effects of ploughing are temporary and tend to disappear under the compacting and hammering influence of rain-drops, hence the seed bed must be worked after rains, especially in soils which are normally poorly structured. Various types of implements, including the disc harrow and grubber, are used to work down the seed bed, check weed growth and prevent re-seeding of weeds. A matter for some debate is whether rotary tillage is more efficient than ordinary methods or *vice versa*. No experiments of this nature have been carried out to date in Queensland cane fields, but it is of interest to note experimental results obtained at Rothamsted. In general, yield results with several crops did not differ greatly with the various forms of tillage, but germination of seed and early plant growth were better in the rotary tilled plots. However, as the season advanced the tilth in these plots

became less favourable to plant growth, the effect being more obvious in some crops than others. It was believed that the initial growth response was due to the loose tilth produced by rotary tillage, but later, setting and compaction of the soil became more pronounced in the rotary tilled plots and checked growth.

The ideal preparation of a seed bed requires cultivation on each occasion after rain has stimulated germination of weed seeds. Thus the land is kept in good tilth and the weed seed population in the surface layer of soil is practically exhausted prior to planting and the young crop is then subjected to less competition from weeds for soil moisture and plant nutrients. Cultivation is best carried out when the soil is not too wet and not too dry. The proper time to cultivate a field is not always easy to define exactly, because most fields do not dry out at the same rate and while certain patches are ready for cultivation, others are too wet. Cultivation should be carried out when the weeds are young and their root systems have not developed to any great extent. Large plants of weeds such as summer grass and pigweed often survive ordinary methods of cultivation and are able to root and grow again. However, weather conditions are not always suitable for best cultivation results and at times excessive weed growth worries even the most efficient farmer.

The labour devoted to hand hoeing of weeds in cane fields is decreasing and will obviously become less and less in the future. The use of horse-drawn implements and, more recently, tractor-driven equipment, has provided easier methods of dealing with inter-row weeds. It is not difficult to forecast that the employment of high clearance tractors with attachable fittings will expand rapidly and eventually crop cultivation will be completely mechanised.

The soil erosion factor in regard to inter-row cultivation for weed control should be seriously considered by all farmers. Cultivation on the contour reduces erosion because little channels are not left down slopes between the rows. Such channels often serve as conductors for excess water and may eventually erode into large gutters. Little or no cane planting in Queensland is done on the contour, but there are a number of areas where contour planting is possible and practicable. In addition, cultivation on gently sloping contours can be more efficient and less power is required than where cultivation up and down the slope is practised.

A form of weed control which may merit investigation is the interplanting of legumes in the row interspaces of young plant and ratoon cane for the smothering out of weeds and the reduction of soil losses. The objective would be to use a legume such as Poona pea to smother weeds during early cane growth; later when the cane covers in, the pea vines would die and lie on the surface. Obvious drawbacks are the competition between the legume and cane for soil moisture and plant nutrients and the nuisance value at harvesting from the growth of volunteer legume plants. Possible advantages would be the reduction in the number of cultivations and better retention of top soil during heavy rains, while the legume vines would add nitrogen and some organic matter to the soil, which would be available for the maintenance of cane growth during the latter part of the growing season.

Other Effects of Cultivation for Weed Control.

One of the main objects of cultivating the soil is the suppression of weed growth, but there is a widely held belief among farmers that the creation and maintenance of a shallow, loose, dry soil mulch on the surface by frequent cultivations conserves moisture, apart from the benefits of weed control. It is appropriate, therefore, to examine here some of the effects which cultivation for weed control may have on the soil. These effects are not as well understood as they might be, and much investigation is required yet to elucidate certain aspects.

The need for weed control is obvious. Weeds take moisture and plant nutrients from the soil which would otherwise be available to the crop. This is particularly noticeable in the luxuriant growth of weeds which follows rain on ground previously treated with surface dressings of fertilizer. If weeds are allowed to grow unchecked, they spread rapidly and choke the cane as well as interfere with its harvest.

Many practical farmers and agricultural workers have held the belief that the loose soil formed by surface cultivation acts as a mulch which reduces evaporation of moisture from the underlying moist soil by keeping it at a lower temperature and preventing the capillary rise of moisture. Evidence on the subject is conflicting and a great deal of investigational work has failed to give a clear picture as to the value of cultivation for conserving moisture under varying conditions and with different soil types. However, when much of this experimental work is interpreted in the light of the depth of the water table below the surface, some very interesting points are indicated. For instance, some cultivation experiments have shown that soil moisture is conserved when the water table is about six feet or less from the surface, and the deeper the mulch the better the retention of moisture in the soil. On the other hand, in experiments in drier areas with a water table deeper than six feet, the soil mulch, in itself, has been shown to be of no value in reducing the moisture loss. Actually under these conditions cultivation may only serve to dissipate moisture particularly that contributed by showers which wet only the surface soil layer.

Briefly soil scientists now hold the view that the soil mulch, by breaking the soil capillary tubes and forming a dry, loose surface mulch does not conserve soil moisture unless a temporary or permanent water table exists within six feet of the surface. If this is true for the soil types and climatic conditions of our sugar areas, the point is of importance to cane farmers, because it indicates that good seed bed preparation and cultivation in the autumn, after the summer rains in many instances have raised the water table to within six feet of the surface, may assist considerably in the retention of moisture for the benefit of the young plants. On the other hand, however, cultivation of dry soil for the sole purpose of maintaining a soil mulch during the winter, spring, and early summer months, when the water table is further than six feet away from the surface, is valueless.

The maintenance of good soil tilth in the growing crop is important. By cultivation at a suitable soil moisture, fair tilth can often be mechanically created and the soil crust which commonly forms on medium and heavy clay soils is broken. Infiltration of rain is promoted, particularly on undulating fields, by improving the porosity of the surface soil. Raindrops tend to destroy tilth and cultivation after rain is required to restore that tilth. Soils which tend to pack readily even

after comparatively light rains require more cultivation than sandy loams and soils of good structure. Hence the need for good soil management to improve soil structure. The degree of permanency of granulation in the soil at planting usually determines the frequency of tillage. In general, inter-row cultivation, except when it is necessary to break up consolidation of the lower soil layers by the grubber, should not be deeper than three inches. Excessively deep cultivation may be harmful, especially in dry weather, because the roots are torn off and plant growth is thereby retarded.

Experience has shown that cultivation of packed soils in certain instances causes a response in plant growth which does not appear to be associated with weed control or soil moisture effects. It is believed that the factor of soil aeration is implicated. The importance of this factor is far from clear, for even in compacted soils the amount of pore space in the surface layers of soil is considerable and apparently sufficient for plant growth. However, compaction does reduce pore space, particularly in medium to heavy clay soils, while aeration is improved by maintaining good tilth and so increasing the total pore space of the surface soil layer. It is probable then, that under certain conditions, improved aeration of soils by cultivation is important.

Summing up, the main services of cultivation are the killing of weeds, the creation of good tilth and possibly the conservation of soil moisture when the water table is about six feet or less from the surface of the soil. Cultivations, which are not required for weed control or breaking the surface crust, should be avoided because the disturbance and breaking of roots of the growing plant are harmful. Cultivation effects may vary on different soils and the different objectives of soil cultivation must be modified according to type of crop, season, and soil.

WEED CONTROL BY WEEDICIDES.

Cane growers do not use weedicides extensively and, on present indications, are unlikely to expand their use very greatly. Weedicides are unlikely to displace cultivation in the major role of controlling weeds, but a good weedicide could be a very useful supplementary control. In furrow irrigated areas where it is not desired to break the water furrows and then reform them, or where elimination of particular weed species is required along creek banks, fence headlands, and other places not readily accessible to cultivation implements, a cheap, effective, and reliable weedicide could be usefully employed.

Before a weedicide could take the place of implements in inter-row cultivation, it would need to be capable of killing weeds normally handled by cultivation, without injuring crop plant growth. Furthermore, it would need to be easy to apply, an economic proposition, not liable to increase the fire risk to cane and preferably should not be unpleasant to handle or toxic to the operator. Spray weedicides usually require that a considerable amount of suitable water be available. A disadvantage also is that under showery conditions, when normal cultivation implements can often be used, a weedicide application may be diluted or washed off so completely as to render it ineffective. On the other hand, however, an effective weedicide would eliminate unnecessary pulverisation of the soil and disturbance and injury to surface roots. Weeds along the row close to the plants could also be controlled. The

weed residues would be left on the surface of the soil to rot down and form a layer of organic matter to assist rain penetration and reduce soil washing. However, where the structure of the soil has greatly deteriorated, particularly on undulating medium to heavy clay soils, it is improbable that weedicides would be a substitute for cultivation which is required to break the surface crust and open up the soil.

It is not intended here to discuss the wide range of materials which have been tried as weedicides, but to discuss briefly a group of new selective weedicides which have received publicity in recent years. These are the synthetic hormone type of selective weedicide. The most commonly employed of these chemicals are 2, 4-dichlorophenoxyacetic acid and salts or esters of this acid. They may be used as dusts or sprays, are non-poisonous, non-inflammable, and not unpleasant to use. On susceptible weeds they cause twisting and contortion of stems and leaves. Stems may thicken and split, the leaves discolour and finally the plant dies. Effects may be seen in twelve hours or so, but death may take several weeks. One or several applications at three- to four-weekly intervals may be required to cause complete death.

These selective weedicides do not cause appreciable harm to plants belonging to the grass family. While this would be advantageous in that cane would not be harmed, it is unfortunate that most of our serious cane weeds, such as summer grass, belong to the same group, and would also be little affected. Hence on present indications 2, 4-dichlorophenoxyacetic acid and its derivatives are unlikely to play a very prominent part in weed control in cane cultivations in Queensland.

The Bureau of Sugar Experiment Stations intends to carry out spraying and dusting trials with this type of weedicide, using a number of different weed species as test plants, and the results will be made available later. Control of weeds such as goat weed, Star of Bethlehem (*Ipomaea Quamoclit*) and volunteer legumes in the cane rows offer scope for the use of hormone type sprays. At present a limited number of farmers in the Nambour area spray the inter-row spaces with an arsenical spray for the control of goat weed. Hormone type sprays, if equally satisfactory, would be an acceptable substitute for the poisonous arsenical solution. The former type is also claimed to cause a temporary soil sterilisation after application, and it is hoped that in addition to killing the plants, germination of goat weed seed will also be prevented or delayed for some weeks. Experiments already conducted in Louisiana have indicated that control of susceptible weeds in the cane row by selective weedicides increased cane yields. In exploratory trials at Meringa results with Noogoora burr (*Xanthium pungens*), goat weed, and several other weed species were promising, and further trials are to be carried out.

FLAME CULTIVATION.

The destruction or checking of weeds and undergrowth by flame throwers has been practised for a number of years, and most farmers are familiar with the common knapsack equipment used for this purpose. The application of flame for inter-row cultivation of crops, however, is of recent origin. Like many other improvements in farm machinery,

flame cultivation is aimed at the reduction of the amount of labour required on the farm, as well as giving more effective control of weeds.

It is based on the principle of selective burning, whereby the young weed growth is destroyed by a flame without seriously injuring the crop plants. The method has been used with success in cane and cotton fields in the U.S.A., particularly in the destruction of weeds in the row. Fallow flaming has also been practised. A brief description of the two main types of machine in common use in Louisiana is given in the October, 1946, issue of the *Cane Growers' Quarterly Bulletin* in an article "The Sugar Industries of Louisiana, Cuba, and Hawaii, with Particular Reference to Mechanical Harvesting and Loading," by E. R. Behne.

Among the advantages claimed for flame cultivation are that it can be used effectively at night, and when the ground is too wet for hand hoeing; the root system is not damaged as with implements; many insects are killed and erosion is reduced by the dead weed residue left on the surface of the soil. In cane fields in Louisiana it is also claimed to improve suckering of the cane and to increase yields. Although cane is comparatively fire resistant the young plant cane does suffer some scorch and there is a possibility that early flaming has a slight adverse influence on the sugar content of the mature crop.

Since no experimental work has been carried out yet in Queensland, no data are available on the economics and efficacy of the flaming machine for use in cane fields. The necessary equipment should not be costly but the fuel item will be important. The cost of the latter will depend on the frequency with which fields will have to be flamed to secure effective weed control. Indications are that to keep a satisfactory check on weed growth weekly use of the flaming machine would be necessary particularly with the more troublesome weeds such as nut grass and the grass weeds.

HANDY FARM AND HOME DEVICES.

Handy Farm and Home Devices and How to Make Them, published in Adelaide by Mr. J. V. Bartlett on behalf of the War Blinded Association, is a book which has had a remarkable sale in other States. It contains about 1,500 useful and practical ideas and suggestions, illustrated by about 1,700 drawings and sketches of which some have been published in this Journal from time to time. The book will be found to be very helpful not only to farmers and graziers but to all householders, motorists, and others, as the wide range of gadgets and wrinkles it contains give just the ideas wanted for doing a handyman's job easily and effectively. In some section of its 300 carefully indexed pages there will be found one or more items which will more than pay for the cost of the book, which is £1 1s. posted.

The author has stated his intention of publishing a series of five books altogether—the second is now in the printer's hands—and many buyers of the first book have already made application for the full series at a subscription cost for the lot of £3 15s. A proportion of the profit on sales is given to the War Blinded Association in each State.

The first and succeeding volumes can be obtained in Queensland by direct application to the Queensland Wool Selling Brokers' Association, Eagle street, Brisbane.

APPLIED BOTANY

Hemlock—A Poisonous Plant.

S. L. EVERIST, Botanist.

EARLY in October, 1947, specimens were received from the Toowoomba district of the hemlock, a plant well known in Europe and Asia to be poisonous to man and beast. This note is published in the hope that the weed may be recognized wherever it appears so that it can be destroyed before it spreads too far.

Other Common Names: Poison hemlock, carrot fern.

Botanical Name: Conium maculatum Linn.

Description.—Erect annual or biennial herb 3–5 ft. high, with a strong mousy smell when crushed; root white, parsnip-like; stems stout, hollow, shining green outside, often with purple spots or patches, repeatedly branched; leaves alternate, sometimes opposite on upper part of stems, 4–12 inches long, deeply divided into narrow segments like a carrot leaf; smaller and less divided near top of plant; flowers very small, white, in clusters (umbels) at the ends of stiff, slender rays $\frac{3}{4}$–1 inch long; rays 8–15 in number, spreading out from the top of a stalk 1–2 inches long; 5 small green bracts beneath the ray clusters; fruits (''seeds'') numerous, about $\frac{1}{8}$ inch long, nearly globular but somewhat flattened with thick ribs. (Plate 112.)

Distribution.—Hemlock is a native of Europe and Asia, now naturalized in most temperate regions of the world. It is common in parts of New South Wales, Victoria and South Australia. In Queensland it is sometimes grown in gardens under the name ''carrot fern'' and in appearance resembles the ''meadow sweet'' or ''bishop's weed.'' This year the plant was reported to be growing thickly in places on Gowrie Creek, west of Toowoomba.

Seasonal Occurrence.—In Queensland, the plant needs a wet winter and spring to make any growth. In Europe, the leaves and stems are reputed to be most dangerous before flowering, and the young fruits to be very poisonous.

Evidence of Poisoning.—*†

(*a*) Field.—For many centuries, hemlock has been known to be poisonous to man. The plant is alleged to be that used by the ancient Greeks for executing state prisoners, including Socrates. Evidence of poisoning in grass-feeding animals is somewhat contradictory, but cases are on record of mortalities in cattle, horses, sheep and pigs. Goats are supposed to be less susceptible than other animals‡, but cases have been recorded.† Cases are also on record of sheep and cattle having eaten the plant without ill effect.†

Plate 112.

HEMLOCK (*Conium maculatum, L.*).

Copied from "The Weeds, Poisonous Plants and Naturalized Aliens of Victoria," by A. J. Ewart.

(*b*) Feeding Tests.—No cases of actual feeding tests have been found in the literature available, but it is assumed that the details of symptoms, post-mortem appearances and lethal doses quoted in the literature are based in part on feeding tests.

(*c*) Chemical.—Several alkaloids have been isolated from the plant. Of these, the volatile alkaloid coniine is most plentiful and several others have been found in smaller quantities. In Europe, in the early stages of growth the toxic principle is chiefly in the leaves. As the fruits develop, the alkaloid moves into them, reaching its maximum concentration in the unripe fruits. Cutting and drying considerably reduces the amount of alkaloid present.

*Symptoms**†.—The following symptoms have been recorded in poisoning by this plant:—

Man.—Excessive flow of saliva, bloating, dilation of the pupils, rolling of the eyes, laboured breathing and gradual weakening of muscular power, often with loss of eyesight. Death occurs after a few hours and the mind usually remains clear until death. The poison acts on the nerves, causing paralysis of the lungs.

Cattle.—Excessive flow of saliva, loss of appetite, bloating, constipation, weakness and stupor. The milk of cows is tainted and pregnant cows have been known to abort. Bloody scours have been observed in some bullocks.

Sheep.—Abdomen tucked up, dazed appearance, dilation of the pupils, unsteady gait, the hind limbs being dragged, coldness; death after a few convulsive movements.

Pigs.—Prostration and inability to move, coldness, slow breathing, livid mucous membranes, feeble pulse, paralysis, particularly of the hind legs, no convulsions.

Goats.—Bloody scours, dullness, loss of appetite, excessive flow of saliva, coldness of extremities, kicking and trembling, grinding of teeth and grunting.

Post Mortem.—It has been stated that there is no characteristic appearance of the alimentary tract on post-mortem examination, though some congestion may be noted.§ The organs are engorged, the blood black and tarry, the right heart full and left heart almost empty.§ In sheep, congestion of the paunch, fourth stomach and bowel have been recorded, and in goats, inflammation of the intestine.†

Prevention.—The weed should be pulled up or dug out and burned wherever it makes its appearance. If there is any doubt about the identification, a specimen should be sent to the Government Botanist for verification. Although hemlock is distasteful to most animals, they will eat it if they are hungry, and care should be taken to see that very hungry animals are not allowed access to it. The plant is easily killed by the hormone-type weedkillers (Methoxone, Weedone 2, 4-diweed, &c.).

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* Long, H. C.: Plants Poisonous to Live Stock. 2nd Edition. pp. 41-42, 1924.

† Hurst, E.: The Poison Plants of New South Wales, p. 302-305, 1942.

‡ Ewart, A. J.: The Weeds and Poison Plants and Naturalised Aliens of Victoria, p. 29, 1909.

§ Lander, G. D.: Veterinary Toxicology, p. 214, 1912.

PLANT PROTECTION

Red Scale Control.

A. W. S. MAY, Entomologist.

RED scale,* a citrus pest of world wide importance, is commonly associated with citrus throughout Queensland and attains major importance in those districts subject to hot, dry atmospheric conditions. Although all varieties of citrus may be attacked, lemons and grapefruit are most susceptible to attacks. Uncontrolled infestations of this pest reduce tree vigour, induce dieback in twigs and small branches, cause excessive leaf shedding, and restrict the normal development of the fruit. The presence of scales on mature fruit detracts from their market value.

This small creamish insect is protected by a reddish parchment-like scale, which, in the adult female, is circular in shape and measures less than one-tenth of an inch in diameter. The scale of the male insect is oval and much smaller. The crawlers escape from beneath the parent scale and seldom wander far before settling down on the fruit, twigs, and leaves. Each then secretes a whitish circular scale, which later becomes reddish and increases in size as the insect grows beneath it.

Seasonal Behaviour of the Pest.

The rate of reproduction of red scale during the autumn months is low, and as conditions are adverse to its survival during the winter, populations fall to a minimum during the late winter and early spring. Although five generations are possible each year, the time between generations decreases with increasing temperatures, and approximately six to seven weeks are required in mid-summer for the young to develop and reach maturity. Thus it can be appreciated that a negligible infestation in early spring may assume serious proportions by late summer and autumn.

Scale Populations in Relation to Control.

Although efficient results may be obtained when a control measure is applied, reinfestation is bound to occur. Invariably, scale colonies comprise individuals of various ages, and some of the more mature scales survive treatment and their progeny soon reinfest the trees. In view of the fact that the rate of scale development is low during the autumn, control measures applied at this period are particularly efficient, for appreciable populations cannot again develop on the trees before the onset of cold weather.

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* *Aonidiella aurantii* Mask.

Although a late summer-autumn treatment may prove suitable for controlling scale on some mid- and late season varieties, it has proved less satisfactory for varieties harvested prior to April or May. If the fruit of these varieties is to be free from scale at harvesting, control must be achieved in early to mid-summer. If populations are reduced to low levels before mid-summer, reinfestation is normally of little consequence before the fruit of early and mid-season varieties reaches maturity.

Choice of the Insecticide.

Either fumigation or a white spraying oil may be used to control red scale, but the benefit derived from either is conditioned by a number of factors.

Although fumigation is a more efficient control measure for red scale than an oil spray application, its use is not advisable before late November. Prior to this period, the mechanical effect of the sheets on the trees may damage the rind of small, tender fruit and knock some of them to the ground. Also, young leaves and fruit may be "scorched." Fumigation must precede the application of copper fungicides in order to prevent foliage injury which may occur if residues are present at the time of treatment, or else be delayed for some time afterwards. On the other hand, fumigation will control some other important pests, such as the larger horned citrus bug and Maori mite.

The value of a white oil spray for red scale control is dependent to a large extent on the thoroughness of its application. Too frequently, poor control can be traced to inefficient coverage which, although at times due to faulty spraying, is more usual in large and densely foliaged trees. The efficiency of an oil spray is also dependent on the age of the scale itself, for some of the more mature individuals and adult scales may survive treatment. Thus spray applications which coincide with periods when young scales are particularly numerous give the most beneficial results.

Although periods of extremely high temperatures should be avoided for the use of either method of scale control, the more obvious adverse effects of oil sprays are particularly noticeable during the summer months. Fruit injury may follow the injudicious use of oil during this period, and it is possible that the increased volatility of the oil at high temperatures may reduce the efficiency of the treatment.

Despite the difficulties involved in its proper application, fumigation should be regarded as an essential part of the red scale control programme when facilities are available. Its use, at least once a year, is recommended on trees of the more susceptible varieties. White oil may be used in conjunction with fumigation where an efficient control of heavy red scale populations is required.

Timing the Applications.

When fumigation or a white oil spray is used, sufficient time must elapse between treatment and harvesting for the dead scale to be shed as the fruit rind expands. This period depends on climatic factors and rind condition and may be as long as six weeks. The pitted or coarse rind often associated with heavy scale infestation, lush growing conditions and some varieties, tends to retain the dead scales for a prolonged period. White oil sprays applied within one month of harvesting tend to delay colouring.

In the past, orchardists were accustomed to spray or fumigate their trees when scale populations became obvious, but this practice proved unsatisfactory. In some districts, too, the timing of fumigation was delayed to meet the larger horned citrus bug position or by climatic conditions, often with a marked loss of efficiency in the control of red scale.

Widely spaced treatments, although sometimes effective on varieties which are not very subject to red scale attacks, may not give effective control in some other varieties. Irrespective of the time when the initial control measure is applied in spring or early summer those scales that survive treatment will continue breeding and may reach pest proportions by late January. Infestation may then exceed that which can be effectively reduced to the required level by a second treatment. The application of a control measure at this period carries a risk of tree injury should climatic conditions be unfavourable, may prejudice fruit colouring and allows insufficient time for the shedding of the dead scales in early varieties.

Following the use of either fumigation or an oil spray, a certain proportion of the red scale population will survive treatment. Should these survivors be subjected to a second treatment before they can breed to any great extent, very few live scales will remain on the trees. Recent experiments have shown that the application of two treatments at an interval of from two to three weeks reduces scale populations to very low levels and that the pest is of little consequence for some months afterwards. Such a double treatment schedule for red scale control should be carried out on a varietal basis, applications being timed by reference to the period of fruit maturity.

The Control Schedule.

Double treatment for red scale control has been designed primarily for quickly reducing heavy infestations and for ensuring scale-free fruit in areas where climatic conditions favour development of the pest. Orchardists will find that the following recommendations differ in some respects from those adopted in the past. If existing practices have proved adequate, they should not be altered. The new double treatment schedule is designed primarily to overcome the difficulty experienced in controlling red scale at Gayndah and may be of value in other districts with a similar climate.

Lemons and Grapefruit.

The early varieties—namely, lemons, and grapefruit—are very prone to red scale attack, and control should be established in the early to midsummer period before pest populations get out of hand. Double treatment of these varieties is recommended, the first treatment being applied in the first half of December and the second two to three weeks later. Naturally, the timing of treatments is influenced by weather factors, but if necessary, the first treatment may be delayed for a short period. However, it is important that the two treatments should not be more than three weeks apart. At least one of the treatments, preferably the second, should be a full strength fumigation; the other may be a fumigation or a white oil spray. If fumigation is impracticable, a white oil spray (1-40) may be used for each treatment.

In lemons, a copper fungicide is often used in late November, or early December for black spot control. This spray will influence the use of fumigation in the scale control schedule. Hence the schedule may commence with fumigation in late November and be followed two weeks later with white oil (1–40) in combination with the copper fungicide. Alternatively a white oil-copper combination spray may be applied in early December, followed by a further white oil spray after the necessary time interval of two to three weeks has elapsed; this schedule is the least efficient of those discussed above.

Double treatment for scale control will greatly reduce scale numbers and, if treatments have been applied thoroughly with the prescribed interval of time between them, there is little likelihood that scales will constitute a problem before harvesting. However, it is important for these early varieties that the first treatment be applied before mid-December.

Navel and Joppa Oranges.

Double treatment of these varieties is recommended prior to mid-summer. Although the schedule may coincide with that recommended for lemons and grapefruit, later treatment is often practicable. However, the initial treatment should not be postponed later than the end of December owing to the likelihood that adverse weather conditions will be encountered in January, when the second treatment would fall due.

Glen Retreat Mandarins.

Full strength fumigation, or white oil (1–40), should be applied between early and mid-January, and followed with a further treatment within three weeks. It is preferable that the first treatment should be fumigation as weather conditions later often tend to hamper the application of this control measure.

Ellendale Mandarins and Late Valencia Oranges.

For Ellendale mandarins and late Valencia oranges, both of which may be classed as late varieties, a double treatment schedule will only be necesary if scale populations are high in late summer. The initial treatment, preferably fumigation, should be applied in late March or early April, depending on weather conditions ruling at the time. A further treatment of white oil (1–40) may follow within three weeks.

Banana Rust Thrips Control.

W. A. SMITH, Assistant Entomologist.

FOLLOWING indications in Departmental trials in North Queensland that DDT and benzene hexachloride might be effective against the banana rust thrips, experiments were carried out in the Pimpama district early in 1947 to test these insecticides under southern Queensland conditions.

Outline of Experiments.

The experiments were located in a plantation comprising mainly first cut Cavendish and Mons Marie bananas. The block used was situated on the northern slope of a spur running east from the hills at Upper Pimpama. Newly thrown bunches were selected for treatment at fortnightly intervals from the early January to mid-March to gain some idea of the relative severity of the attacks on bunches thrown at different periods during summer.

In the first experiment, the bunch and bunch stalk were treated with one or other of the following insecticidal dusts:—DDT, DDT and nicotine, nicotine alone, and nicotine applied under brown paper tubes permanently attached to the bunch. All insecticides were applied at fortnightly intervals except for nicotine which has no residual effect and must be applied weekly. Some bunches were treated for six weeks, some eight weeks, and some for the whole life of bunch. Treatments in this experiment ceased on 20th May, because, by then, thrips activity on untreated bunches had become negligible.

In the second experiment, DDT and benzene hexachloride were the insecticides used, the former being applied in both spray and dust forms. They were applied to the whole stool—bunch, pseudostem and suckers—in an attempt to prevent reinfestation of the bunch. For comparison the spray was also applied in one series of stools to the bunch alone. The need for treatment was determined by the presence of living thrips on the fruit at fortnightly examinations and this resulted, for the dusts, in four fortnightly treatments with a final treatment a month after the last of those, and for the sprays in three fortnightly treatments followed by a final spray six weeks later.

Prior to, and for the first two weeks of the experiment, the weather was exceptionally dry. Cyclonic winds and rains towards the end of January caused some plant losses in the experimental block. Heavy rains were again experienced towards the end of March.

The banana rust thrips was moderately active in the plantation during the course of the experiment, but more serious rusting has been experienced on north coast plantations in some past years.

Nicotine Dusts and Brown Paper Tubes.

The nicotine treatments were included in the first experiment to provide known methods of control with which to compare the new insecticides.

A 3 per cent. nicotine dust applied at weekly intervals through the life of the bunch kept the fruit tree from commercial rust, although the top hand in some bunches was moderately damaged. When treatment was stopped six weeks after the bunch was thrown, a significant increase in rust resulted, but some degree of control was still achieved.

Good control of rust was obtained on bunches covered with double brown paper tubes as early in the life of the bunch as practicable and also dusted fortnightly with 3 per cent. nicotine dust. This treatment proved somewhat better than that in which weekly applications of a nicotine dust were applied to uncovered bunches. Even when the nicotine dustings were stopped after three treatments, very few of the covered bunches showed commercially rusted fruit.

Dust residues remained on all nicotine treated bunches and were greatest on those treated right up to cutting time. The bulk of the dust was removed by dipping the bunch after it was cut in a drum of water. The residues are not poisonous.

Brown paper tubes were used in the experiment because good quality sugar hessian was difficult to obtain at the beginning of the season. Many were blown off the fruit by cyclonic winds and had to be replaced as soon as possible to prevent sunscald. The type of fruit produced under bags was very attractive from the market point of view, being light in colour and unblemished by sundry pests or sunscald.

DDT.

This insecticide proved very effective for rust prevention on bananas. Without exception, when used on the bunch as a 2 per cent. dust with fortnightly applications through the life of the bunch, it kept the fruit free from commercial rust. The maximum damage was a light rusting restricted to the contact points of adjacent fruits in the upper hands, and even this damage was not apparent on many bunches. Equally good control was obtained on bunches given only four fortnightly treatments, but a little commercial rust did develop when the number of treatments was cut down to three.

In the second experiment later in the summer, the DDT dust was used at 4 per cent. strength. By this time, thrips were less active, but still in sufficient numbers to provide a contrast between treated and untreated bunches. The dust applied at fortnightly intervals kept the fruit free from rust with rare exceptions, but there were no indications that the higher concentration was necessary or that treatment of the whole plant is better than treatment of the bunch alone.

Dust residues were almost the same as in the nicotine treated bunches, and again removal of much of it was effected by dipping the cut bunch in water.

For the spray an 0·2 per cent. DDT agricultural emulsion was used. It provided good protection against thrips, but no apparent benefit was derived from spraying the whole plant rather than the bunch alone. This may have been due to the fact that the damage on most of the treated bunches was restricted to the smoky stage and little or no commercial rust developed. Further trials under more severe thrips infestation would be necessary to compare the relative merits of these treatments.

Some fruit burn was noticed with the 0·2 per cent. DDT emulsion. It took the form of a purple spotting on the fruit surface; but it was neither severe nor always present on the treated bunches. Apparently, 0·2 per cent. is the upper concentration at which the emulsion can be used with safety on the fruit. At the time of the experiment a water-dispersible DDT powder was not available for test, but this type of DDT spray may prove equally effective and less likely to injure the plant if concentrations of more than 0·2 per cent. are accidentally applied.

Spray residues on the fruit were present as white spots, but were barely noticeable.

Two combination dusts each containing 2 per cent. D.D.T. and 2 per cent. nicotine were also used. In one of these, the components were mixed just before each application; the other was purchased as a ready-mixed dust. Fortnightly applications of the fresh-mix gave results comparable with nicotine dusts applied weekly, although it proved superior when the number of treatments were limited to three. The ready-mix gave a reasonable degree of control, but on the whole was inferior to all other treatments. It has since been reported elsewhere that nicotine and DDT are not compatible in dusts with an alkaline diluent, the DDT losing some of its insecticidal efficiency. However, in view of the results obtained with DDT alone, there seems to be now no point in considering this combination for rust thrips control.

Benzene Hexachloride.

A 4 per cent. benzene hexachloride dust containing 0·5 per cent. of the gamma isomer was applied fortnightly to the whole plant in the second experiment. No bunch thus treated developed any commercial rust, and some fruit on only two of the bunches developed any redness at all. Again the test was not a severe one, because of the relatively low thrips activity, but this new insecticide showed promise of being equal or superior to DDT for rust thrips control.

A sample of benzene hexachloride emulsion was tested in sprays containing ·025 per cent., ·0375 per cent., and ·05 per cent. of the active constituent. Fruit burn occurred at all three concentrations and, consequently, these sprays were omitted from the experiments.

Recommendations.

Where an area is free of thrips, any planting material brought in should come from a thrips-free area or, if that is not possible, from an area of light thrips infestation.

If thrips are already present in the plantation, treatment of the bunch will usually be necessary to protect it from rust blemishes during summer. From early October, a watch should be kept for smokiness (an early indication of thrips activity) between the fruits, particularly those in the top hand. When it becomes fairly general, and perhaps on some bunches extensive, control measures should be started. Normally this will not occur until November, or occasionally later. Thrips damage will practically cease again in April or May the following year.

Four applications of a 2 per cent. DDT dust on each bunch at fortnightly intervals from the time it is thrown should give adequate control in a normal season, but the following points should be noted:—

(*a*) If rust develops on some of the early summer-thrown bunches after the fourth dust application, thrips populations will be very high, and fortnightly treatments should be continued right through the life of the bunch.

(*b*) The damage caused by thrips early in the life of the bunch can be severe, so the first treatment should be applied to each bunch as early as practicable. When dusting is carried out on one day in each fortnight, some bunches may be thrown for 13 days before receiving their first treatment. In a moderate thrips outbreak, one dusting day a fortnight has proved satisfactory. In a severe outbreak, the same procedure should be followed, but it may be desirable to treat any newly-thrown bunches during the intervening weeks. Such bunches would, of course, be treated again during the following week and thus brought into the fortnightly treated series.

(*c*) Bunches which have emerged from the throat of the plant but not yet opened will probably benefit by a few puffs of dust.

(*d*) If four treatments only are given to each bunch, some system of marking the bunch to indicate the number of treatments it has received may be necessary, or the grower will have to accurately judge its age and treat only those up to two months old. The latter method should be the more serviceable.

(*e*) In dusting, the aim should be to get a light, even film of dust on the fruit and the bunch stalk. Excessive dust may require removal when the bunch is cut.

If it is desired to use hessian covers on bunches of low-growing varieties to improve the appearance of the fruit, the DDT dust should still be applied. It may eventually prove possible to reduce the number of dustings from the four required on uncovered bunches to two on covered bunches if the covers are of good quality sugar hessian. When dusting inside a covered bunch, particular care should be taken to get a light, even dust-flow, as the residues are not removed by wind and rain as they are on exposed bunches.

THE KEEPING OF FARM ACCOUNTS.

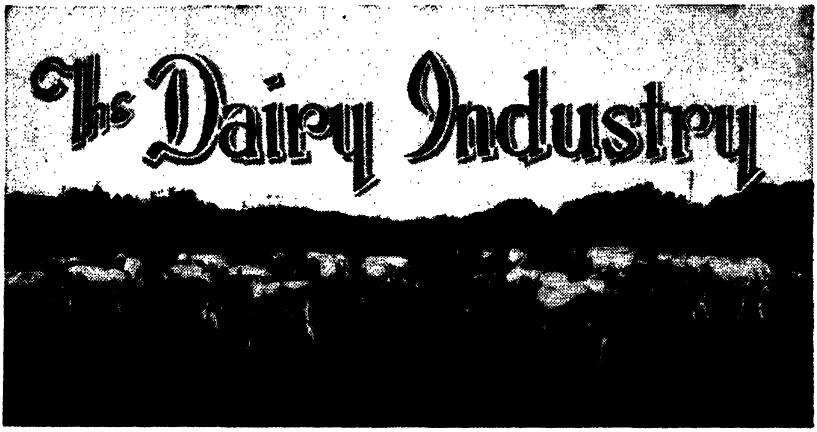
In the business of farming, as in any other commercial enterprise, the keeping of accounts is a necessity.

An accurate system of bookkeeping, besides showing the results of trading operations, will enable a farmer to see his exact financial position and to say definitely what he is worth at a particular date; what he owes; what is owing to him; and whether he is gaining or losing.

To meet the need of a simple system of keeping farm accounts, the Department of Agriculture and Stock has published a handy brochure on farm bookkeeping. A copy may be had free of charge on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Plate 113.
BALED HAY FOR STORAGE.

Plate 114.
ANOTHER LOAD FOR THE HAYSHED.



The Production, Processing, and Transport of Milk Under Tropical Conditions.

W. C. T. MAJOR, L. MORIARTY,[†] and D. S. ROBERTSON.[‡]

UNDER the Health and Dairy Produce Acts milk for human consumption must conform to a very high standard of quality. The attainment of these desirable standards is a difficult matter under adverse tropical conditions, particularly where the product has to be hauled long distances; milk from Malanda district is transported to Townsville, a distance of 217 miles by road and rail through a humid, tropical climate.

The object of this article is to outline the methods which have given satisfactory results in providing Townsville with a high-quality market milk. The success of these methods is largely due to the close co-operation between the farmer and the factory and the efficiency of the transport system.

Healthy Herds.

The supplying of a high-quality milk depends, in the first place, on healthy herds. Cows should be free from such diseases as tuberculosis and mastitis, the first because of its public health significance and the second because of its effect on the keeping quality and the composition of the milk. All herds at Malanda have been tested for tuberculosis and care is taken to detect and reject any mastitis-infected milk.

Dairy Shed Methods.

The sheds and surroundings are kept scrupulously clean, neat and tidy. To do this efficiently with the minimum labour, layout and construction of the sheds and yards needs careful consideration. Concrete floors and drains and adequate protection from the weather have been found necessary to reduce to a minimum contamination from dust, mud and manure, as well as to provide comfortable conditions for milking.

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† Senior Dairy Adviser, Innisfail.
‡ Dairy Officer, Malanda.

The following milking methods have been found to be of considerable assistance in the production of high quality milk:—

1. Wash the teats and udder of the cow and hands of the milker with a clean solution of hypochlorite and completely dry the teats, udder and hands before commencing milking.
2. Practise dry-hand milking on hand-milked herds.
3. Use a strip-cup to detect abnormal milk.
4. Where machines are used, dip the cups in a hypochlorite solution between each cow in order to reduce the spread of mastitis.
5. Use clean udder cloths.
6. Immediately after each milking thoroughly wash the milking machines and utensils.
7. Clean out the sheds and yards.

Scrupulously clean and sterilized utensils are necessary for the production of city milk in the tropics. The following simple rules of shed sanitation are closely adhered to by milk suppliers to the Malanda factory. As soon as milking is finished the machines and the utensils are: (*a*) first rinsed with cold water; (*b*) washed with hot soda water; (*c*) rinsed with boiling water; and (*d*) sterilized with steam. The utensils are then placed on racks to dry. Twenty minutes before the commencement of milking a solution of one of the proprietary brands of hypochlorite is run through the milking machine and then used to rinse other utensils. This solution is later used to wash the hands of the milker and the udder and teats of the cows. As investigations have shown that the germicidal value of the solution decreases rapidly after washing the udder and teats of six cows, a fresh portion of this solution is used for every sixth cow.

Care of Milk on Farm.

Immediately after milking, the milk is cooled to 60 deg. F. or as low a temperature as possible. It is then stored in a roadside milk box or a farm refrigerator until transported to the factory.

Factory Treatment and Transport.

Milk Grading.

On arrival at the factory the milk is graded, tipped and weighed. Samples of each supplier's milk are then taken for bacteriological and chemical analysis. The samples are first tested by the methylene blue reductase test. Samples with a methylene blue reduction time of less than 5½ hours are then examined microscopically in the laboratory. From the appearance of the milk sample examined under the microscope the cause of the defect is determined. The farmer is then advised that the milk is of unsuitable quality and further supplies are separated until the quality reaches the desired standard. The reason for its unsuitability is stated and the supplier advised of the remedy. The response to this service has resulted in a good quality milk supply, increased sales and almost negligible losses due to "sour milk."

Laboratory Control.

The campaign for improved milk quality hinges on the laboratory. Here milk grading is carefully carried out, the farmer advised of the quality of the supply, and if unsatisfactory the cause determined scientifically. The laboratory also checks the treated product to ensure efficiency of pasteurization and processing of the milk by means of the phosphate test and plate counts.

Processing.

At Malanda an A.P.V. plate heat exchanger is used to pasteurize the milk supply. The milk is heated to 162 deg. F., held for 16 seconds, and then chilled to 34 deg. F. To ensure that the pasteurization is efficiently carried out all pasteurized milk is tested by the phosphatase test, a sensitive test which enables even the slightest error in processing to be detected. Plate counts are also carried out to ascertain the efficiency of pasteurization and processing of the milk. Routine chemical tests are conducted to ensure that all consignments conform with the standards laid down in the Health Act.

Can Washing.

Cans, which usually arrive back from the depots in an unsatisfactory state of cleanliness, are first hand scrubbed and then passed through a rotary can washer. The cans, prior to being used, are rinsed with a chlorine solution of suitable strength. The lids are also subjected to the same treatment before being replaced on the cans.

Transport and Temperatures.

During the peak period in 1944 when large quantities of liquid milk were required in Townsville, insulated box bodies were constructed on 3- to 5-ton truck chassis for transporting milk by road from Malanda to Innisfail, a distance of sixty-one miles. Processed milk ranging in temperature from 34–37 deg. F., loaded on to these vehicles at Malanda at 2.30 p.m., arrived at Innisfail with very little rise in temperature in the cool of the tropical evening. The milk was then off-loaded into railway wagons previously pre-cooled with ice. The goods train carrying the milk left Innisfail at 10.20 p.m. and arrived at Garbutt Siding, Townsville, at approximately 3.30 p.m. the following day, an interval of at least 25 hours elapsing between entraining at Malanda and arrival at Townsville. En route the milk was kept at a low temperature by the utilization of 44-gallon drums containing a mixture of ice and salt. Temperatures on arrival at Innisfail during the summer months averaged 42 deg. F.

Modification of the above technique, involving the distribution of 6 cwt. of cracked ice over the cans and throughout the van, has resulted in temperatures as low as 37 deg. F. being recorded on arrival at Townsville. At present the cans on being loaded at Innisfail are covered with 15 cwt. of cracked ice. This procedure has resulted in temperatures ranging from 34–38 deg. F. being recorded on arrival in Townsville.

Efficient organization has ensured the low temperatures which have been carefully recorded at Malanda and on arrival in Townsville.

Contemplated Improvements.

The use of rail tankers for conveying the milk from Malanda to Townsville—294 miles—is being considered. It is hoped to fit the tankers with a means of controlling milk temperature. This is considered necessary in view of the long journey through a hot tropical climate and inevitable rail delays which occur at times through tropical storms. Adequate temperature control is essential to maintain the quality of the milk and ensure a satisfactory article for consumers.

Conclusion.

The Atherton Tableland Co-operative Butter Association, by constant attention to details not only on the farm but also at the factory and during transport, has proved that it is possible to supply high quality milk to a distant city situated in the most humid tropical area in Australia. It has been demonstrated that for the maintenance of quality an efficient laboratory is essential. The laboratory control enables specific advice to be given to the farmer to assist him with his milk problems and a constant check to be kept on processing at the factory. This eliminates guesswork and maintains a constant standard of quality.

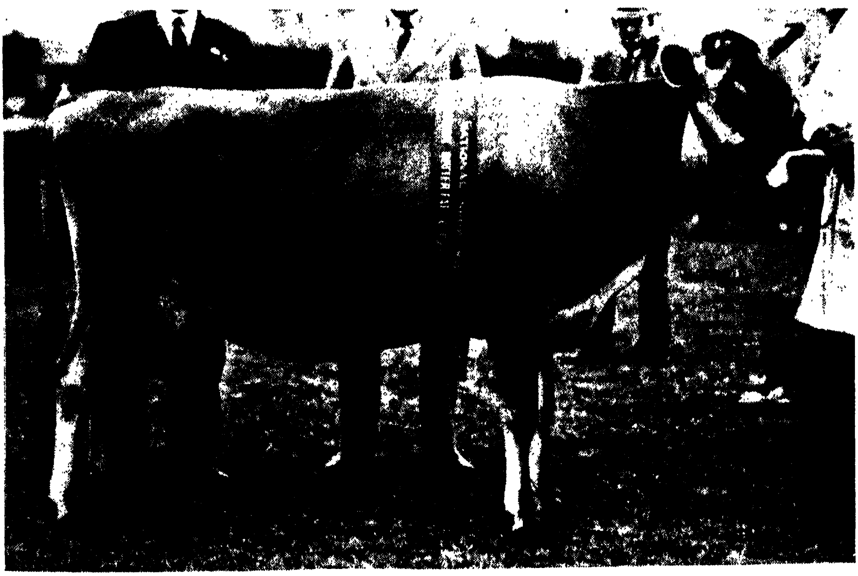


Plate 115.

CHAMPION BUTTER FAT COW at the 1947 Brisbane Show.—"Gem May," of the GEM JERSEY STUD, KENMORE, the property of Mr. Wallace Bishop.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. Jersey and Guernsey Societies Herd Books, production records for which have been compiled during the month of September, 1947 (273 days unless otherwise stated).

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE (STANDARD 350 LB.).				
Mountain Home Gem 42nd	H. C. Lester, Glengallon	9,820·85	401·991	Fairvale Ensign
JUNIOR 2 YEARS (STANDARD 230 LB.).				
Faversham Dewdrop 9th	W. D. Davis, Chinchilla	6,619·35	271·19	Croydon Marchese
JERSEY.				
MATURE (STANDARD 350 LB.).				
Westwood Leda	F. Porter, Cambroon	8,067·8	411·592	Hunstreets Emperors Volunteer
Westbrook Tulip 122nd	L. E. Harmer, Beaudesert	8,418·15	386·806	Selsey Royal Standard
SENIOR 4 YEARS (STANDARD 330 LB.)				
Glenrandle Jean	P. Kerlin, Killarney	7,750·3	419·060	Bellgarth Stylish
Windsor Princess Madge	H. G. Johnson, Gleneagle	7,092·65	415·437	Bobs of Wingate
SENIOR 3 YEARS (STANDARD 290 LB.).				
Bellgarth Fairy 4th	D. R. Hutton, Cunningham	6,298·15	304·916	Trecarne Victor 2nd
JUNIOR 3 YEARS (STANDARD 270 LB.).				
Brooklands Cream Flake	W. S. Conochie, Sherwood	8,342·3	465·766	Englove Cunning Victor
Connemara Mistress	J. J. Ahearn, Conondale	6,252·65	330·062	Trinity Mighty Prince
SENIOR 2 YEARS (STANDARD 250 LB.).				
Glenrandle Lotus Lily	P. Kerlin, Killarney	4,823·8	253·096	Bellgarth Glory King
JUNIOR 2 YEARS (STANDARD 230 LB.).				
Brooklodge Victorine	J. J. Ahern, Conondale	5,664·85	298·601	Trecarne Some Victor 4th
Brooklodge Style	J. J. Ahern, Conondale	5,288·85	271·457	Trinity Mighty Prince
GUERNSEY.				
SENIOR 2 YEARS (STANDARD 250 LB.).				
Willowbrae Sparkle	E. G. Foxton, Maleny	5,209·7	252·415	Linwood Peace Boy

Beef and Dairy Cattle Champions.

R.N.A. SHOW BRISBANE, 1947.

Plate 116.
JUNIOR CHAMPION HEREFORD BULL.—"Blandford Better Luck." Mrs. N. P. Wright.

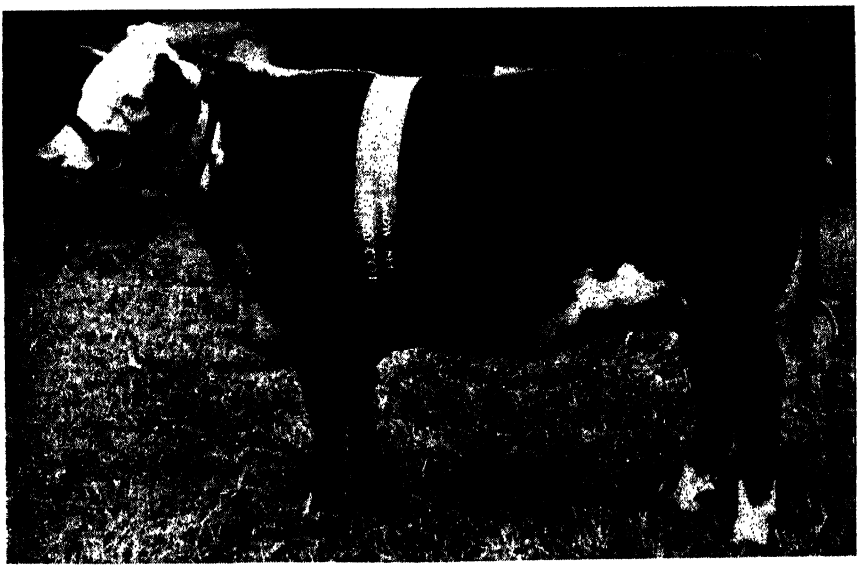


Plate 117.
CHAMPION POLLED HEREFORD COW.—"Eulogie Cherry 3rd." E. W. McCamley.

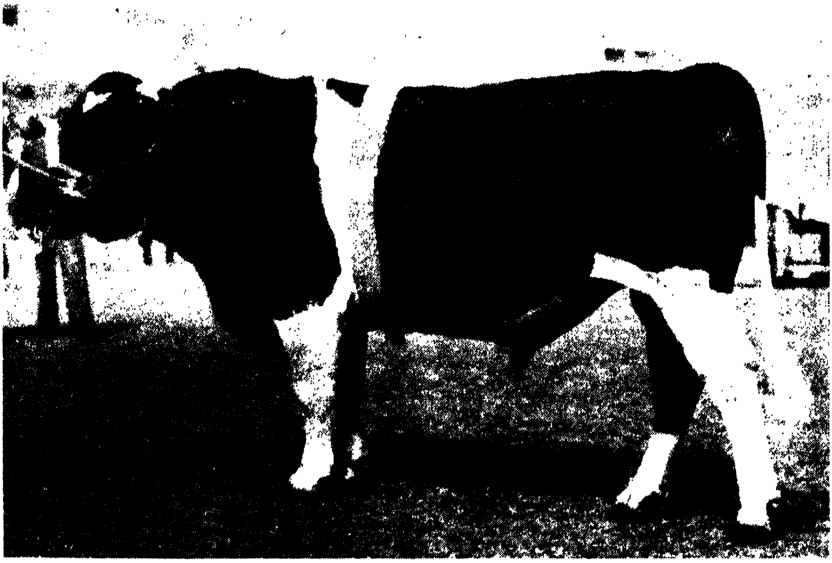


Plate 118.
CHAMPION FRIESIAN BULL.—"Anama Transvaal Stamp." J. P. Larson.

Plate 119.
CHAMPION FRIESIAN COW.—"Ivavale Novice 7th." Young Bros.

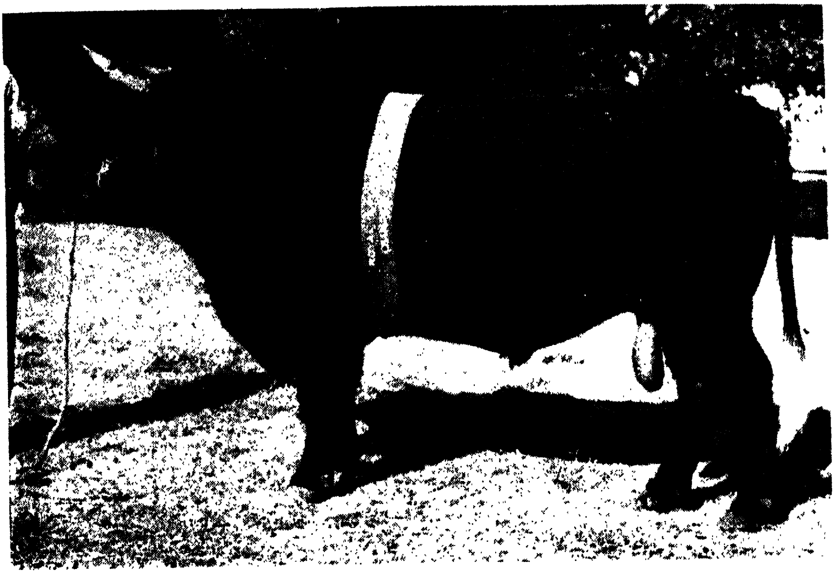


Plate 120.
CHAMPION DEVON BULL.—"Devon Court 3238th." R. A. Howell.

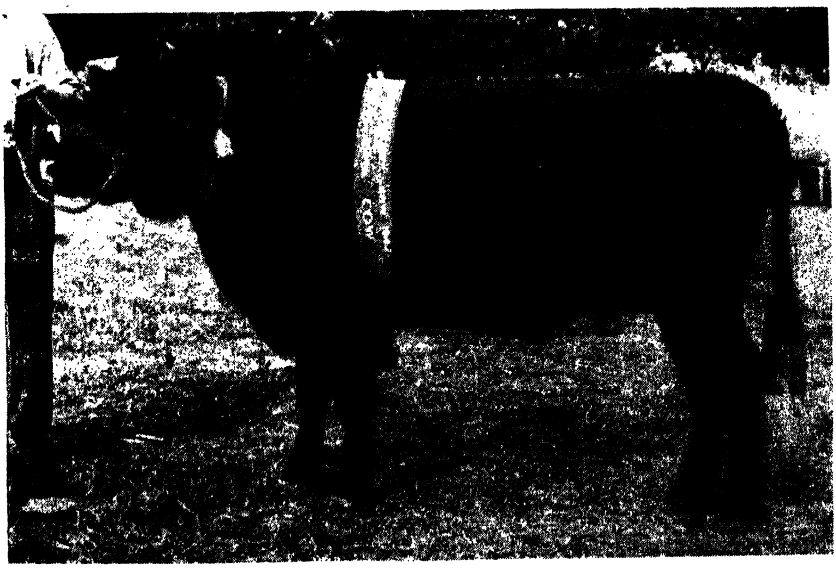


Plate 121.
CHAMPION DEVON COW.—"Devon Court Gipsy Countess 3405th." R. A. Howell.

Plate 122.
CHAMPION GUERNSEY BULL.—"Laureldale Prospect." W. A. Cooke.

Plate 123.
CHAMPION GUERNSEY COW.—"Laureldale Buttermaid." W. A. Cooke.

Cleaning and Disinfection of Poultry Houses.

C. MANNING, Poultry Inspector.

TOO much stress cannot be given to the importance of a thorough and proper cleaning of the poultry quarters. Accumulations of poultry manure, fouled litter and dust give rise to many diseases, as well as harbourage for lice, ticks, fleas, mites, and worm eggs, causing the flock to be unduly upset by irritation with consequent falling off in production. Although poultry can be treated for parasites, it is more economic to attack the infestation at its source by cleaning and disinfection of poultry houses and equipment than by treating after the infestation has occurred. Then again, from the production standpoint, the quality of eggs is affected by staining, which may be caused by accumulations of excreta and fouled litter. Wet floors may also facilitate bacterial invasion.

On many poultry farms the only cleaning done is the sweeping of manure and litter from fowlhouse floors. This is not enough if disease and parasites are to be kept in check. Coccidia, as well as other disease-producing organisms, have been found in the dust on the walls, rafters, and wire-netting of fowl sheds.

The cleaning of poultry sheds and yards should not be left until they are filthy, but should be part of the regular farm routine, and should be planned so that the sheds are cleaned before they become offensive. Poultry, as with other farm stock, appreciate well-kept sanitary quarters and clean, vermin-free sheds. As well as inducing greater egg output and making work more congenial, cleanliness in the fowlhouse reduces the number of eggs to be cleaned, and ensures a better grade product and bigger returns to the farmer.

Apart from routine cleaning, poultry sheds which have been used for the housing of grown birds and are intended for the housing of young stock should be disinfected and kept in repair, as pullets may not have developed the resistance to disease that more mature birds may have. It is at this time also that any repair work that is necessary should be done without disturbing the birds.

It is recommended that every fowlhouse should have floors of concrete. However, where wooden floors have been put down these have given satisfaction and are easy to keep clean, but as the cracks in the flooring cannot be effectively cleaned out, the farmer has to rely on disinfectants to penetrate these parts. It should be remembered that

these disinfectants are not effective on organic matter. Wooden floors, therefore, are not as good as concrete. Earthen floors cannot be thoroughly cleaned and may be a habitat for all kinds of disease-producing organisms and larvae of parasites.

When cleaning pens for young stock, the nest boxes should first of all be emptied of their contents, treated with creosote or used sump oil, and then allowed to stand either in the sun or a draughty position for, say, some weeks before replacement in the sheds. Next, the perches should be removed and scraped, also the supports and slots. All accumulations of fouled litter and excreta should be cleaned out dry and bagged. However, some excreta may adhere to the floors of the sheds; to remove this, first soak it and then scrape it off with a flat spade. It may not be practicable to hose fowlhouse walls because of no pressure water system, but where it can be done it should be done, making sure that all dust is removed from the tops of the rafters, cracks, and crevices of the building. Hosing of the fowlhouse is, of course, preferable to dry cleaning, for once heavy accumulations are removed the germ-laden dust does not lodge.

Routine cleaning of poultry houses should not be done while the fowls are still in occupation, as shifting the birds upsets them and may affect their laying.

With the semi-intensive system of housing poultry, a start should be made with the cleaning of the yards, as in raking up the accumulations of litter dust may arise and settle in the sheds. Yard litter may be spread over the grazing area after sticks, weed-stalks, and other rubbish have been removed and burnt. There is usually a ready market for fowl manure, and when cleaning the fowlhouse this should be gathered and bagged dry.

When poultry are housed on the intensive system, cleaning should be done with as little disturbance to the birds as possible, working from one end of the shed to the other. As fouled material is removed, it should be replaced with clean litter.

Under the semi-intensive system the birds may be locked out in the yard while cleaning is in progress. As in the cleaning of unoccupied houses, nests should first be emptied and then the perches and supports cleaned and scraped. The walls, netting, rafters, and uprights should then be swept, care being taken to minimize disturbance to the flock. Perches, walls, and uprights should then be treated with either creosote or used sump oil. To hasten drying the perches should be sprinkled with fresh sawdust or litter. Some farmers prefer to lime-wash the walls. If creosote is used, care should be taken that it does not come in contact with the operator's skin, and particularly his face, if a spray is used in its application.

When cleaning vacant pens, floors should be thoroughly disinfected with a good germicide, but effectiveness of any disinfectant depends largely upon how well the cleaning has been done. A small amount of litter or sweepings may neutralise the effect of any disinfectant, hence a frequent complaint of money spent without beneficial results. Not until the floor of the shed is completely clean and dry should any disinfectant be used; then, for best results, the disinfectant should be used in strict accordance with the manufacturer's recommendation.

Carbolic acid (phenol), chloride of lime, and several coal tar preparations are available and are all satisfactory for general poultry farm usage. Sodium hypochlorite is also a good cleansing agent with germicidal qualities.

When the floor of the pen has dried, fresh litter should be placed on it to a depth of several inches. Pine sawdust or shavings are best for this purpose, although good straw, peanut, or rice hulls may be used. Litter should be dry and not damp or mouldy. Moulds may cause a respiratory disease known as aspergilliosis in chickens, for which there is no cure.

When chicken houses or battery brooders are being cleansed and conditioned for the reception of young stock, these premises, especially the woodwork, framework, and netting floors, should be scrubbed and cleansed with either a soda solution or sodium hypochlorite. When everything is thoroughly clean and dry, the use of a fresh solution of some efficient disinfectant is advisable.

If the chicken houses have concrete floors it is advisable to cover them with small amounts of litter daily. The used litter should be gathered and burnt daily and so reduce the risk of infection from disease-laden droppings. If sand is used, this also should be swept up daily and replaced with fresh sand.

Most poultry raisers have small runs in front of the chicken houses which are ploughed and planted with some green feed for the young stock. This is a good practice, as the ground gets the benefit of sunlight when turned over regularly.

Plate 124.

WEIR UNDER CONSTRUCTION ACROSS THE LOCKYER.

ANIMAL HEALTH

Milk Fever *(Hypocalcaemia)* and Pregnancy Toxaemia of Ewes.

G. R. MOULE, Officer-in-Charge, Sheep and Wool Branch.

MILK fever (*hypocalcaemia*) and pregnancy toxaemia are two conditions which affect sheep and closely resemble one another. As it is possible to treat one of these conditions successfully, it is important that a correct diagnosis should be made and the following notes have been compiled to assist woolgrowers in this matter.

MILK FEVER.

The name milk fever is actually a "misfit," as there is really no fever—i.e., no rise in temperature with the complaint. The disease may occur in ewes before, during, or after lambing, but it is not confined to ewes, for sheep of either sex may be affected.

Cause.

Milk fever is caused by a sudden drop in the amount of calcium circulating in the blood. The occurrence of the disease does not necessarily indicate that there is an actual deficiency of calcium in the country. In point of fact, the level of the calcium content of the blood is controlled by a special calcium regulating mechanism, and during the time when the young lambs are developing within their dams' bodies, or when the first flow of milk is being produced, there is often a sudden call on the readily available calcium in the body. The animal carries a large store of calcium within its bones, and when there is a lag period between the *mobilization* of the bone calcium and the time of this *sudden call* on the *readily available calcium* of the body, milk fever develops.

Observations have shown that milk fever becomes much more prevalent as the age of the ewe flock increases. An attack may be precipitated by a large number of conditions which include the following:—

Fasting.—The fasting to which sheep may be subjected during shearing, crutching or jetting, road or rail journeys is a common cause of milk fever.

Poison Plants.—Some plants, many of which are regarded as good sheep feed, contain at certain stages of their growth large quantities of oxalic acid. On being eaten, this oxalic acid lowers the blood calcium and thus sets up "milk fever." Pigweed and soda bush are two plants rich in oxalic acid.

Cold, Wet Weather.—Some of the losses which follow cold, wet weather are caused by milk fever.

Drugs.—The toxic action of carbon tetrachloride is partly dependent on its capacity to produce a lowering in blood calcium.

Exercise.—Exercise may cause a sudden drop in blood calcium and thus precipitate symptoms of milk fever.

Diet.—A diet which is low in calcium is likely to predispose animals to a lowered blood calcium, and in this regard it is as well to remember that maize, grain sorghum and wheat, which are often fed to lambing ewes as a drought supplement, are particularly low in calcium content. Fat lamb "mothers" grazing green oats often suffer from a sudden lowering of blood minerals.

Parasitic Infestations.—Even light infestations of hair worms (Trichostrongyles) will decrease the amount of calcium in the blood of sheep, and in this way may predispose to acute attacks of "milk fever."

Symptoms.

(i.) If the sheep are watched carefully, the first symptom seen is excitement. They become very unsteady on their feet—stagger in their gait—arch their backs and put their heads out as if in an effort to prevent falling.

(ii.) When down, some animals manage to rise, but only with great difficulty. If lifted, they assume a cramped, crouched attitude as though their feet were too sore to take their weight. At this stage there is usually considerable trembling of the muscles. This often gives one the impression that the sheep is making grimaces.

(iii.) If the affected animal remains down, it becomes drowsy and finally unconscious. Its glassy eyes and slow, shallow breathing give it the appearance of being dead. Food is usually regurgitated from the paunch (rumen) and the nostrils become clogged. When this occurs the animal makes a snoring noise when trying to breathe through the nose or else it breathes through its mouth.

(iv.) Despite the apparently unconscious condition of the animal, it will be found practically impossible to bend the legs, which are usually stretched out straight.

(v.) Death usually occurs rapidly (i.e., within 24 to 48 hours) if affected sheep are left untreated.

(vi.) When a bad outbreak of milk fever develops at lamping time, it may be noticed that the unaffected animals in the flock appear to be drowsy and sleepy.

Treatment.

The obvious treatment is to correct the lowered blood calcium by the injection of a calcium solution under the skin. A suitable solution is prepared by warming the following ingredients until they dissolve in the water:—

Calcium gluconate	¼ oz.
Boric acid	¾ drachm
Water	3 oz.

The dose is injected under the skin when the water has cooled to blood heat.

A stock solution of the calcium may be prepared and will keep well if tightly corked. The stock solution can be diluted and used as required. The injection is easily made under the unwooled skin, say inside the leg, with an ordinary hypodermic syringe. The skin should be cleaned with a little methylated spirit or iodine before the needle is inserted.

An alternative is to purchase calcium-boro-gluconate already prepared, and use it as a 20 per cent. solution, the dose being 30-50 cc. injected at blood heat as described above. Sheep usually recover in from ½ to 1 hour, although it is often necessary to treat affected animals more than once.

Prevention.

The prevention of outbreaks of milk fever is based on providing diets adequate in calcium and in controlling internal parasites, particularly hair worms. In addition, care should be taken with travelling animals to prevent over-fatigue and prolonged fasting. Likewise, if in-lamb ewes are being worked through yards, special care should be taken to make sure that they are not subjected to long periods of starvation.

If plants containing oxalic acid are prevalent, care should be taken during mustering and every effort made to keep travelling mobs off parts of the stock routes where these plants are plentiful. It should be remembered that fasting will bring about a decrease in the amount of calcium circulating in the blood and accordingly hungry animals are already predisposed to "milk fever" and they, in particular, should be kept off plants likely to cause trouble. If crossbred ewes with lambs at foot are grazing green oats special care may have to be taken. The precautions which may be considered are—

(1) Confining the sheep on a small area with a temporary fence and seeing that they eat the oats right out before moving them on to the next area.

(2) Allowing the sheep access to a paddock containing fairly dry grass as well as oats. This ensures a more varied diet and the animals get more roughage.

PREGNANCY TOXAEMIA.

Pregnancy toxaemia develops in ewes during the later stages of pregnancy. The exact cause of the disease is not clear but it is known that the nutrition of the sheep does play an important part in its occurrence. It is particularly widespread in Queensland and is often the cause of severe losses.

Predisposing Causes.

It has been observed that sheep on a falling plane of nutrition are more likely to develop pregnancy toxaemia. Sudden changes in diet will also precipitate an attack. Interesting outbreaks have been observed in the field under widely different conditions. In the Clermont district in 1944, in-lamb ewes carrying a fair length of wool were badly affected with grass seed in late April and early May. As a result, the sheep became too sore to walk and accordingly stayed about the water troughs and did not go out to graze. Because of this, starvation

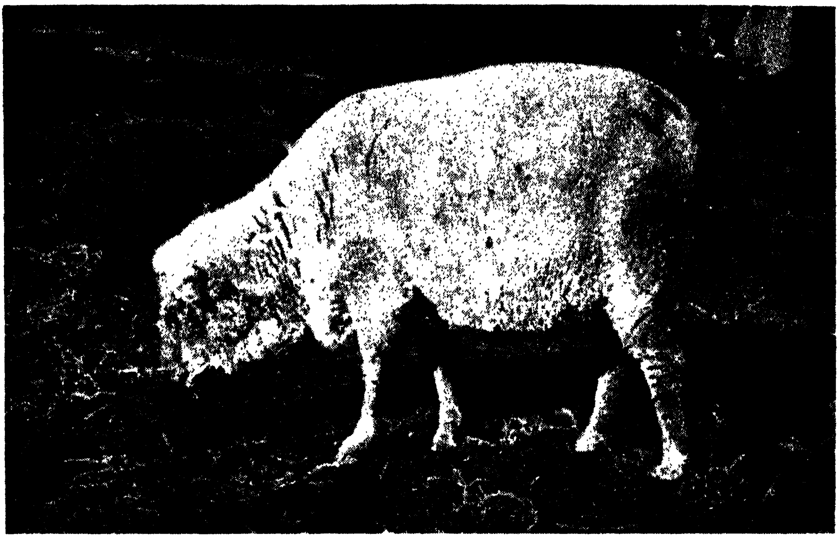


Plate 125.
Ewe showing Symptoms of Pregnancy Toxaemia. (Note Stance.)

Plate 126.
Ewe showing Advanced Symptoms of Pregnancy Toxaemia.

pregnancy toxaemia developed. In the Muttaburra district in 1942, in-lamb ewes which were running on black-soil plains were caught in heavy rain. Many of the animals became bogged and pregnancy toxaemia caused heavy mortalities. The disease also was very prevalent in the South-west during the drought conditions of 1946.

Although many of the predisposing causes of the disease appear to be similar to those of "milk fever," the chemical changes which take place in the body in these two diseases are not alike. Pregnancy toxaemia appears to result when the liver is unable to convert the nutriments mobilized from the body's reserve stores in the muscles into a form which can be readily utilized.

Symptoms.

The symptoms seen are indefinite, but may be set down as follows:—

(i.) The ewes are dull, listless and appear to be fatigued for several days before the outbreak develops.

(ii.) Sometimes animals stand with their heads lowered as though they are eating (Plate 125), but there is actually a disinclination to eat. Sometimes, on the other hand, the head is held high with the ears drooping. At this stage the animals appear dazed and can be approached and caught without making any effort to take evasive action.

(iii.) Apparently the sight is impaired, and the sheep will stagger along with a blundering gait and swinging head. Finally, the ewes go down (Plate 126), and may linger for some days before death supervenes.

(iv.) Sometimes there is twitching of the face and ear muscles, grinding of the teeth and fit-like seizures.

(v.) The careful observer will notice affected animals are inclined to be constipated, and while urination is normal at first it later becomes suppressed.

(vi.) The offspring is usually alive until the time the ewe dies, athough sometimes abortion occurs.

Post-mortem Findings.

Usually there is nothing very spectacular to see on post-mortem examination. Sometimes the liver is fatty and "soapy," and in many cases there are twin lambs, but this is not always the case.

Prevention.

It is not a simple matter to make recommendations which will be easy to apply in the field, because the occurrence of the diseases is closely bound up with seasonal conditions. Mating breeding ewes in anticipation of relief rains at lambing time is a gamble in the pastoral areas of Queensland because of the low rainfall reliability. Mating after good rains also is a risk because unless "follow up" rains fall the plane of nutrition of the ewes is usually declining as pregnancy advances and there is insufficient food just at the time when it is most needed. Accordingly, in planning property management to prevent

the occurrency of pregnancy toxaemia, full consideration should be given to the location and improvements on the property as well as to seasonal conditions, the occurrence of grass seeds and shearing dates.

It is a basic principle of good management to curtail periods of starvation of pregnant ewes to an absolute minimum and this, of course, means careful handling of sheep at pre-lambing crutching or jetting, or at shearing time.

The provision of a supplement for ewes during the last six or eight weeks of pregnancy is often useful if the pastures deteriorate rapidly at this time. A few ounces of ground grain sorghum or meatmeal per day to which has been added a little sterilized bonemeal, salt and/or molasses is inexpensive and will often save the lives of a large number of ewes and lambs.

Differential Diagnosis.

It is often difficult to differentiate between milk fever (*hypocalcaemia*) and pregnancy toxaemia. There are certain pointers in the history and symptoms which are summarized below, but it is as well to keep a hypodermic syringe and some calcium-boro-gluconate on hand and to try treatment before making any final decision as to the nature of the complaint.

Milk Fever (Hypocalcaemia).

1. There is usually an abundance of feed, and often certain plants, such as pigweed or soda bush, may be growing in profusion.

Occasionally there is a sudden scarcity of feed.

2. A rail or road journey or a period of starvation.

3. May affect any sheep, irrespective of sex and/or condition. (Pregnant ewes probably more susceptible.)

4. Sudden onset with fairly rapid loss of consciousness. Early death if untreated.

5. Response to calcium injections.

6. Can occur at any time.

Pregnancy Toxaemia.

1. History of a falling plane of nutrition for some time beforehand, or a sudden change of diet.

2. Rail or road journey or a period of starvation.

3. Affects pregnant ewes only, usually during the last two months of pregnancy.

4. Onset slow, early loss of appetite, gradual onset of drownsiness and stupor, no sudden loss of consiousness Lingering death.

5. No response to calcium injections.

6. Stops suddenly as soon as lambing is over.

Note.—It is always advisable to treat affected sheep with calcium-boro-gluconate. If this fails it may be worth while injecting 15 cc. of a 5 per cent. solution (1 oz. to a pint of water) of magnesium sulphate (Epsom salts). This is because the control of the amount of calcium circulating in the blood is closely linked with that of the amount of magnesium, and a fall in the level of the latter may produce symptoms very like those produced by a lowering of calcium.

If the animals do not respond to either treatment and the symptoms and history are similar to those described above it is reasonably certain the condition is pregnancy toxaemia.

[GRASSHOPPER BAITS.—Referring to the possibility of grasshopper plagues, the Minister for Agriculture (Hon. H. H. Collins) stated recently that the distributing firm did not maintain stocks of gammexane in Brisbane but ordered them from Melbourne as required. The use of poison baits had proved suitable for the control of grasshoppers in closely settled areas and experiments had shown that gammexane was a good bait ingredient. He advised anyone who contemplated its use to place an early order. Rail transport from Melbourne usually takes eight or ten days.]

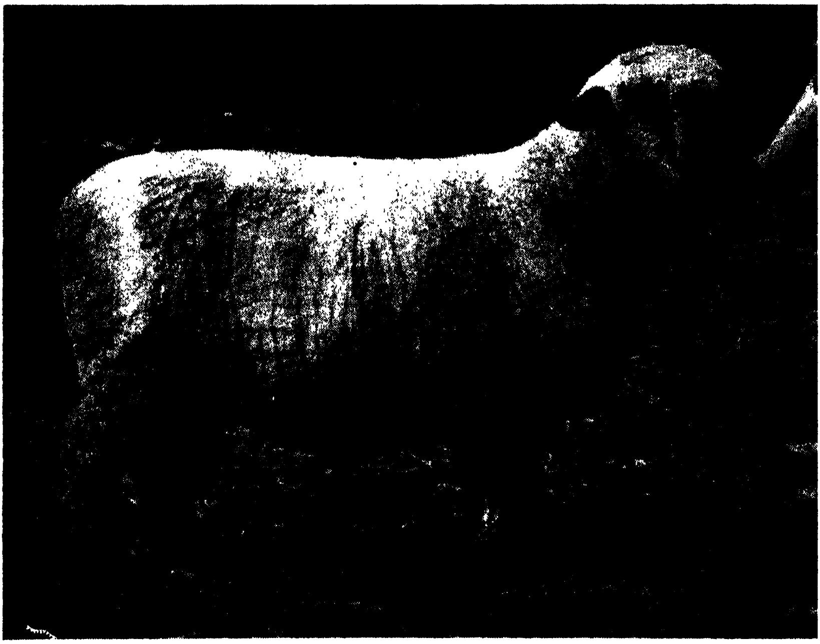


Plate 127.
A BRITISH SHEEP BREED TYPE.—Hampshire Down Shearling ram, bred by Sir William Rootes and sold recently to a U.S.A. breeder.

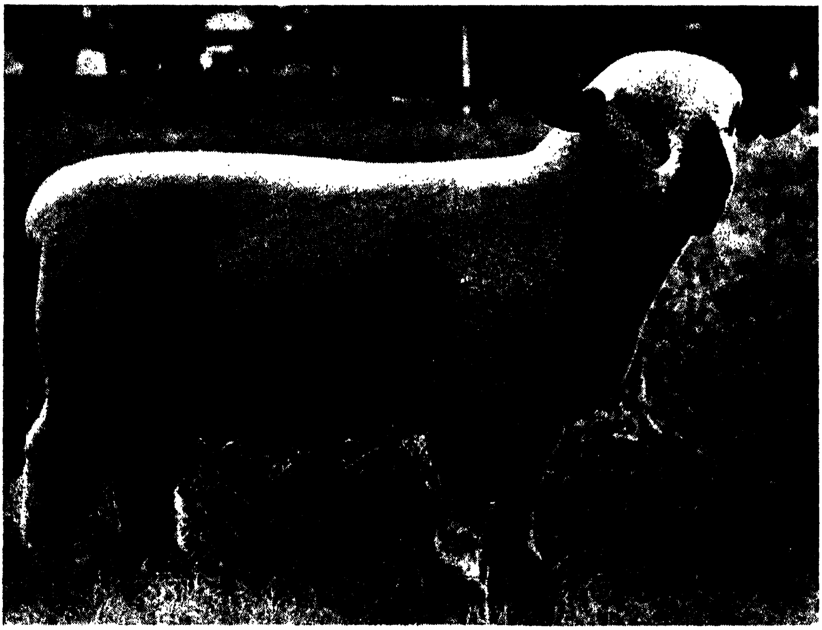


Plate 128.
A BRITISH BREED TYPE.—Three-times Champion Hampshire Down ram, Stype Monarch III., bred by Sir William Rootes, Stype Farm, Berkshire, England.

Co-operative Use of Farm Machinery.

AT a recent conference which was convened by the Minister for Agriculture and Stock (Hon. H. H. Collins) to discuss means of overcoming the effects of recurrent dry periods in Queensland, representatives of primary producers' organizations present were unanimously of opinion that the success of any plan for conserving fodder in larger quantities on farms depends to a great extent on the availability of modern farm machinery, particularly for harvesting.

Investigation has shown that the comparatively poor response to past fodder conservation schemes was caused by shortage of labour for the harvest. Most fodder crops must be harvested at a certain stage of maturity in order to achieve best results. This necessitates the concentration of all available efficient labour on the task over a comparatively short period. If labour is short, only a limited amount of fodder can be conserved. With machinery, however, the harvest can be speeded up and the labour required reduced to a minimum.

Modern machinery for harvesting is expensive and it would not be economical, therefore, to suggest that individual farmers should purchase machines entirely for their own use. It has been demonstrated in some districts that it is practicable for groups of farmers to share the cost of buying machines and operate them co-operatively to their mutual advantage.

Publicity has recently been given to co-operative schemes in the Gayndah and Beaudesert districts and this has aroused the interest of farmers in other areas. For their information and guidance the basis of operation of these machinery pools is set out.

It is understood that farmers in some other districts have united for the group purchase and co-operative use of farm machinery and implements. Particulars and results of any such enterprise would be welcomed for publication in this *Journal*.

The Gayndah Co-operative Scheme.

The Gayndah Co-operative Dairy Association owns a number of machines and general farm tools which are made available to suppliers to the factory on a hire basis. In this way, the Association is materially assisting dairy production in the district. Among other useful implements is a concrete mixer available for 3s. a day. A saw bench is to be added by which a farmer may cut enough wood in a few hours to keep his household supplied for up to six months. The association also has a winch, stocks and dies, wrenches and spanners for the use of which a small charge is made. At present, negotiations are proceeding for the purchase of a post-hole digger and a power-driven post-hole borer.

About two years ago, a group of farmers in the district submitted a proposal to the executive of the Association that a header-harvester be purchased at a cost of £280 and be made available to suppliers on a hire basis. The proposal was considered carefully and it was foreseen that certain difficulties were likely to arise which would militate against the success of a scheme to provide harvesting machinery. Weather, an important factor, had to be considered. The rainy season at Gayndah occurs in January, February and March, and thus limits the period

during which grain crops can normally be harvested to about two months. During this short period, there would be a big demand for such machines as were available and unless sufficient could be provided to meet the needs of all, some crops would deteriorate because of the late harvest and might even be lost altogether, and so cause dissatisfaction among the farmers concerned.

The Association could not see its way clear to finance the purchase of enough machines to meet the needs of all; and so it was suggested that small groups of farmers should purchase their own machines. Two such groups, each consisting of five farmers, have been formed and have bought their own header-harvesters capable of harvesting 200 acres of sorghum each within the safety period of 6 to 8 weeks.

The groups work on the co-operative principle and members help one another between milkings. Each member advanced a share of the purchase price, provides his own fuel and bags and pays a levy at the rate of 1s. 6d. an acre of crop into a bank trust fund to provide for maintenance and replacement. The members mutually agree when the machine can be worked. They have entered into an agreement under which the manager of the Association shall act as arbitrator in the event of any dispute.

Group Use of Farm Machinery at Veresdale.

The original scheme was initiated in December, 1943, when Paul's Ice Cream and Milk Ltd. of Brisbane made farm machinery and implements (one of each type) available for group use by dairy farmers in the Veresdale area, in the Beaudesert district, as follows:—

W.4 McCormick Deering Tractor;

G.L. 70 3-Furrow Disc Plough;

7 ft. Tandem Disc Cultivator (with scalloped discs);

Heavy Mouldboard Plough } for making trench silos.
Mechanical Scoop }

The total cost of this machinery was roughly £800, and the only stipulations respecting this machinery were—

(1) That it would be used to grow and conserve additional fodder thus increasing production.

(2) That a small committee of farmers would control its operation and make a charge for its use to cover cost of fuel; wages of operator; repairs, maintenance, and depreciation—an amount sufficient to ensure that enough money would be in hand to replace the machinery as it wore out.

A management committee of three was set up—comprising Messrs. T. M. Richardson, W. H. Teese and J. McGrath—with another farmer, Mr. K. C. Stewart, keeping the books. Another local farmer was engaged full time to operate and look after the machinery. A charge was struck on an hourly basis for actual time and machinery worked on a farm.

In the early stages there was much scepticism regarding the success of group use of machinery. To gain support, a low rate of 9s. per hour was made, but this charge has since been raised to 12s. per hour. This rate may yet prove to be somewhat on the low side to fully cover cost of replacement.

A simple set of rules governing the operation of the unit was drawn up. The unit has serviced up to 50 farms in one year and has worked within a radius of 10 miles from the centre, although most of the work has been done within a circle of 5 miles.

With the original plant the work done was confined to ploughing and cultivating land preparatory to sowing, together with the sinking of a great number of trench silos and several dams. Although very little pasture renovation has been attempted, a fair amount of cultivation of lucerne paddocks with the tandem disc cultivator has been done.

Later, other equipment was added by the group itself and included—

(1) A suitable trailer for transporting the group machinery.

(2) A grinding machine with which a great deal of work has been done grinding grains for stock feeding—wheat, milo, oats, barley and maize.

(3) A second 3-furrow plough to obviate delays through breakages.

Neighbouring farmers have also shared in the purchase of other machines—such as huskers and shellers, and circular saws, using the group tractor to operate them.

The order of work has been arranged according to applications for work received. No job, however small, has been refused and in nearly four years of operation of this group scheme there has been a complete absence of any friction over allotment of work. The success of this effort in group use of machinery has been largely attributable to the fair and capable control exercised by the management committee; and also to the excellent service given by the operator, Mr. L. A. Hiscock.

In the case of the Veresdale Group there has been a continued evidence of confidence in acquiring and putting to good use additional labour-saving equipment. Accordingly, three years after its inception the group decided to purchase two new modern labour-saving machines:—

(1) I.H.C. Automatic Hay-baler;

(2) I.H.C. Ensilage Cutting and Harvesting Machine.

Financial assistance to purchase these machines was satisfactorily arranged through the Agricultural Bank. To simplify the position relating to the purchase and ownership of these additional machines, the group of farmers concerned formed themselves into a small co-operative society early in 1947, and it is intended that this co-operative society will later acquire ownership of all machines previously operated by the group committee.

A board of five directors was appointed to control the co-operative committee as follows:—T. M. Richardson (chairman), J. McGrath, W. H. Teese, R. L. Harrison, K. C. Stewart (secretary).

This co-operative society will now have the power to purchase any additional equipment or goods required by its members; already the co-operative committee has bought on behalf of members large quantities of concentrates for stock feeding.

The possibilities of labour saving by the two machines are great. The automatic hay-baler only requires that a field of lucerne or grass be cut and raked, after which it is a one-man job for the tractor operator to pull the hay-baler along to the windrows. The machine will bale up to 4 to 5 tons an hour. A charge for the hay-baler drawn by the group tractor has been struck at £2 an hour. The ensilage machine will cut and chaff and deliver into a tip truck or trailer up to 7 or 8 acres of maize or sorghum a day. Besides the ensilage machine, two trucks and trailers at least are required to deliver the chaffed material into the silo, and to operate the machine to capacity it would require a team of 4 men (including the tractor driver). The hire of this machine has been set down at 25s. per hour.

Over the past 3½ years there is no doubt the group use of machinery has not only overcome the labour shortage in the Veresdale area, but has also been responsible for a big increase in production.

Plate 129.

A Question of Quality.—Early Morning Visit to the Brisbane Fruit and Vegetable Market. *From Right to Left:* Messrs. Guy Short, Harry Moon, and Hector Spring (Division of Marketing, Department of Agriculture and Stock) with Harold Campbell (Rural Broadcasts Officer, Australian Broadcasting Commission).

MARKETING

Production Trends, October.

The favourable seasonal conditions experienced during September were well maintained by moderate October rains throughout the farming areas of Queensland.

In the dairying districts pastures have responded well to the mild weather and good summer fodder crops for grazing are expected. The production of milk and cream is rising rapidly, but warmer weather conditions and a prevalence of weed taints are beginning to affect milk and cream quality.

Wheat grain harvesting has commenced, and providing weather conditions remain favourable, a record crop of 10 million bushels should be obtained.

In the main southern areas favourable weather has facilitated the sowing of extensive areas of general summer fodder crops. Some excellent cuttings of lucerne have been obtained in the Lockyer and adjacent Southern Districts.

A review of the previous estimate of 550,000 tons of sugar has revealed a slight increase and it is now estimated that the current crop will produce 557,000 tons of 94 n.t. sugar.

In the Mareeba-Dimbulah districts tobacco has been planted out on irrigated lands, and seed-bed work is progressing in the dry farm areas of this district. Land preparation on seed bed-work is also under way in the South-west tobacco districts.

Marketing Board Elections.

The term of office of the present members of The Butter, Cheese, Egg and Cotton Marketing Boards expires on 31st December, 1947, and postal ballots are now in progress for the purpose of electing the growers' representatives on these Boards for a period of three years commencing 1st January, 1948.

A referendum is also to be conducted to decide whether The Cheese Marketing Board will continue to function until 31st December, 1953. The duration of The Butter Marketing Board and of The Egg Marketing Board will be extended until 31st December, 1953, and 31st December, 1950, respectively, as no petition came to hand requesting a ballot on the question of the extension of the operations of either of these boards.

A Potato Marketing Board is to be set up under the Primary Producers' Organisation and Marketing Acts for a period of three years from 1st January, 1948. An election of growers' representatives on this new Board is also in progress.

World Census of Agriculture.

The Food and Agriculture Organisation of the United Nations proposes to conduct a World Census of Agriculture in 1950. The first of a series of regional meetings has been held in Rome where members of the F.A.O. staff met experts from European countries to discuss a list of basic items proposed as minimum schedules for the census. Later meetings will be held in Latin America, the Middle East and the Far East. After interchange of viewpoints at these meetings, F.A.O. will submit formally to governments the list of basic items for the 1950 Agricultural Census.

Farmers' Co-operatives.

Addressing the American Institute of Co-operation at Purdue University recently, George H. Maughan said:—"Farmers need much more help than they are getting in developing a co-operative philosophy. We are not thinking of the academic methods and facts so often stressed by the professional teachers. We have in mind the matter of participation—thinking, speaking, acting in local groups without stress on how this is done. Managers, all responsible employees of co-operatives, are the natural teachers and leaders in this work. They should assume the duties of educating and actuating their employers—the patrons. This takes wise, unselfish, statesmanlike leadership."

GENERAL NOTES

Staff Changes and Appointments.

Messrs. J. B. Davey (Department of Agriculture and Stock, Nambour), J. T. O'Rourke (Traveston), J. R. Craigie (Banks Creek, Fernvale), S. J. Kuskie (Wilston), R. J. MacBean and M. J. Hurley (Department of Agriculture and Stock, Brisbane) have been appointed inspectors in the Horticulture Branch, Division of Plant Industry, Department of Agriculture and Stock.

Messrs. W. A. H. Cheales (Gympie) and A. K. G. Watt (Upper Coomera) have been appointed growers' representatives on the Banana Industry Protection Board until 30th September, 1948.

Mr. P. J. O'Sullivan, Assistant Parasitologist at the Animal Health Station, Yeerongpilly, has been appointed a member of the Veterinary Medicines Board in succession to Dr. F. H. S. Roberts, who recently resigned.

The resignation of Mr. H. K. Lewcock, Assistant Director of Marketing and Senior Marketing Officer in the Department of Agriculture and Stock, has been accepted as from 24th November, as tendered.

Drought Feeding of Stock.

The fodder problem in drought feeding is much more difficult in pastoral districts than in agricultural areas nearer the coast, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said in the course of a recent Press announcement. It is well known that the storage of hay in a hot dry climate is risky, because of moisture loss and deterioration of feeding value. Grain alone is not sufficient for animals, as some roughage is normally necessary.

Mr. Collins added that his Department had looked into this aspect of feeding in pastoral areas and had formed the opinion that much could be done to offset the effects of dry seasons by growing suitable fodder trees possessing high feed value. Arrangements were accordingly being made with the Director of Forests for the raising of seedlings for planting by stock owners.

Among the best fodder trees are kurrajong, Portugese elm and Bella sombra, each of which has a high protein content comparable with that of choice lucerne. They are suitable for the Darling Downs and the South-west, while the two first named also grow well in the Central West. Portugese elm has achieved its greatest development in the Burnett district and has become naturalised along the banks of the Burnett River, especially near Gayndah.

The bottle tree, weeping myall, mulga, and carob bean are other good fodder trees. The trunk of the bottle tree is the best part of it for stock food and when opened up it will help to maintain a fairly large number of animals for some weeks. It is rich in starchy material and may be compared with fair-quality oats rather than with hay. The bottle tree and weeping myall both grow well on the Darling Downs and in the South and Central-West. The feeding value of weeping myall may be regarded as comparable with good eaten hay.

Mulga grows best in the Maranoa and far South-west and responds readily to natural regeneration. As a stock food, it conforms very closely in all respects, except in ash content, with the composition of cereal hay.

The carob bean is a native of the Mediterranean, and consequently thrives best in somewhat cooler parts, such as the Darling Downs and Southern highlands, but may also be suitable for the South-west. The bean approximates the composition and feeding value of sorghum; it is better than oats and rather poorer than maize.

Fauna Sanctuaries.

Orders in Council have been approved to-day under the Fauna Protection Act which declare the property of Mrs. E. M. Lodwick, "Water View," South Yaamba, and the property of Mr. R. W. Birchley, "Dawson Park," Cracow, to be sanctuaries for the protection of native fauna. Mr. L. R. Birchley has been appointed an Honorary Fauna Protector in connection with the sanctuary on the latter property.

Certified Seed.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) stated recently that the first seed to be sealed and labelled as certified seed in Queensland has been harvested from two crops of Wheatland grain sorghum grown in the South Burnett district by Messrs. S. E. Marshall and C. J. Turner, of Wooroolin. This is a further step towards putting into operation a system for the certification of various seeds for sowing.

Certification provides for the selection of ground and growing of crops under the supervision of departmental seed certification officers. This supervision includes the roguing of crops and such other action as may be necessary to ensure that the resultant seed is true to type and free from prohibited seeds.

Certified seed can only be sold in packages sealed and labelled by the Department of Agriculture and Stock.

Mr. Collins added that, in the interests of growers who are desirous of producing crops true to type and of first-class quality, the provisions of the Acts with reference to the production and sale of certified seed would be strictly enforced.

Cattle Husbandry Branch.

The Department of Agriculture and Stock has for many years provided animal husbandry advisory services in respect of sheep, pigs, and poultry, and now proposes to extend such services to dairy and beef cattle. Accordingly, a Cattle Husbandry Branch will be set up within the Department's Division of Animal Industry, and the Minister for Agriculture and Stock (Hon. H. H. Collins) has announced the appointment of Mr. R. D. Chester, B.V.Sc., Government Veterinary Officer, to be Officer in Charge of the Cattle Husbandry Branch.

Mr Chester served for a number of years in the Central district and the Wide Bay and Burnett areas prior to coming to Brisbane, and is well acquainted with all phases of animal production, especially in its relation to beef cattle.

Roofing Material for Slaughter-houses.

An amendment of Regulations under the Slaughtering Act provides for the substitution of corrugated fibro cement for corrugated iron as a roofing material for slaughter-houses. This amendment has been prompted by the present difficult supply position regarding galvanized iron.

Soda-bush Poisoning of Sheep.

The Minister for Agriculture (Hon. H. H. Collins) said recently that after a heavy mortality in a consignment of sheep trucked to Cannon Hill there had been rumours that the cause of death was anthrax. Mr. Collins said that the carcasses had been examined by officers of his Department who had reported to him that the rumours were entirely without foundation, and it was considered that the death of the sheep was caused by soda-bush poisoning. Investigations would be continued in the area near Charleville from which the sheep were trucked.

Mr. Collins also stated that no case of anthrax in livestock had ever occurred in Queensland; outbreaks had occasionally been reported, but subsequent field and laboratory investigations had always proved the reports to be false.

Cheese Marketing Board.

The Minister for Agriculture and Stock (Hon. H. H. Collins) has announced that the following nominations have been received for the election of three growers' representatives on the Cheese Marketing Board for the three-year term commencing 1st January, 1948:—

Duncan, Reginald C. (Toowoomba)
Latham, William Alfred (Goomeri)
McIntyre, Malcolm (Pittsworth)
O'Shea, David Gabriel (Southbrook).

Messrs. O'Shea, McIntyre, and Duncan are the present sitting members of the Board.

As a petition requiring a poll on the question of the extension of the Board's operations for the period 1st January, 1948, to 31st December, 1953, has been signed by the requisite number of growers a referendum will be necessary to decide whether or not the Board will continue to function for such period.

The referendum and the election will be held on 22nd December, 1947.

GADGETS AND WRINKLES

HOW TO OBTAIN RIGIDITY IN CRATE CONSTRUCTION.

One of the features of a crate is rigidity or ability to resist weaving and skewing during transportation. No method of joining the corner members of a crate, not even the three-way corner construction, is sufficient alone to give rigidity to a crate. Some kind of bracing across the faces is usually necessary.

Figure 1 shows a kind of bracing found in many crates which are sent to the United States Forest Products Laboratory, Madison, Wis., for testing. Partly because of the amount of material used, this construction appears to be very strong. Laboratory tests have shown, however, that crates so braced are weak in the diagonal direction of the faces, and are therefore apt to weave and skew during transportation.

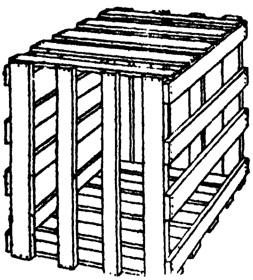


Figure 1.

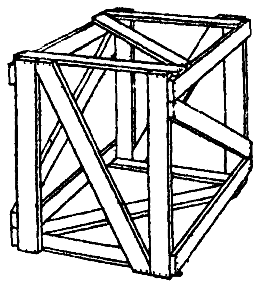


Figure 2.

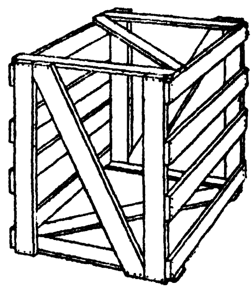


Figure 3.

Diagonal braces on six sides as shown in Figure 2 have been found to give a maximum rigidity for a minimum amount of timber. Crates so braced withstand with considerably less distortion twice as great a diagonal compressive force in actual tests as crates braced as shown in Figure 1.

A combination of diagonal and parallel slat bracing as shown in Figure 3 makes the crate more rigid than parallel bracing alone, but not so rigid in all directions as cross bracing on the six sides. It may be found an advantage in packing contents which need protection on the sides and are rigid enough themselves to withstand stresses in the direction in which the crate is weak.

Solid sheathing on all the faces does not make a crate so rigid as diagonal bracing, except perhaps sheathing which is made of wide boards with tighter joints than can usually be obtained. The crate with ordinary sheathing might withstand as great a load, but the distortion caused by that load would be greater than the crate with diagonal braces, and would ordinarily be great enough to allow damage to the contents.

THE LIFE OF ROPE.

Ropes which are constantly exposed to severe climatic conditions quickly deteriorate unless precautions are taken to give them some measure of protection, which is most readily done by tarring them. To tar a rope, put some Stockholm tar in a bucket and slowly pass the rope through the liquid; as it comes out wipe it down with a piece of rag, and then hang it along a fence in the sun until dry.

It is not advisable to tie a knot in the ends of a new rope to prevent the strands from unravelling. Thread a packing-needle with waxed sewing twine, lay one end of the twine along the rope and bind back over it for a couple of inches, pulling the twine tight. Then grease the needle, force it through the rope down the centre of the binding, pull tight and cut off the twine.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

HEALTH AS BASED ON HABIT.

THE baby less than a year old usually receives much more attention than the child who is running around. This should not be. The toddler or pre-school child needs as much thought on the part of the parents as does the baby—perhaps even more. When parents are making every effort to give the proper care to the child who is leaving babyhood behind many questions arise: How fast should he be growing? How many tteth should he have? What food is best for him? How can he be helped to build good habits?

Remember that the job of bringing up a family should not be left to the mother alone. It is the biggest and most important job in the world and both parents should combine their efforts and work together to bring out the best in their children and to help them to good health habits so that the minds and bodies with which they are born will develop to their full capacity.

Teaching a child to carry out habitually and without conscious effort the things which make for good health is one of the first duties of this mother-father partnership.

As you know, habit is a tendency to repeat what has been done before. It is a way of behaving, thinking or feeling that once established is easily followed. Remember—habits are *learned* not inherited.

The first health habits to establish are concerned with the fundamental daily activities of the child—eating, sleeping, playing, eliminating and keeping the body clean and suitably clothed. Good habits in these activities should be learned in the first three or four years of a child's life. Once learned they are likely to last a lifetime.

Many people think of habits only as ways of acting and forget the even more important habits of thought and feeling. A child may be taught not only to dress himself, but to like suitable and attractive colours and to dislike a dirty blouse or a torn stocking. So he develops habits of good or bad taste, neatness or untidness as the case may be.

Even his attitude to life is partly a matter of habit. A child learns to be cheerful and happy or sulky and cross according to the habits he forms in his early years.

More about good health habits next month. In the meantime any information or advice on the subject of this article or any other matter concerning mother's and child's health may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

Afternoon Tea Loaves.

Half pound flour, pinch of salt, heaped-up teaspoon of baking powder, little milk. Sift the flour free from lumps, put it into a bowl with the salt and baking powder mix these dry ingredients thoroughly, then add just sufficient milk to form a dough. Be careful not to add too much milk, as if the dough is sticky the loaves will be heavy. Turn it out on to a floured board and, as quickly as possible, form it into little cottage loaves. Put them on to a greased baking tin and bake immediately in a hot oven. They will take 15 minutes. Just before they are done brush them over with a little milk.

White or Wholemeal Scones.

This is a good average recipe for either white or wholemeal scones. Both are made in the same way. Two breakfast cups self-raising white or wholemeal flour, a good pinch of salt, about 2 tablespoons butter, and about 1 cup cold milk. Have a hot oven ready before you think of mixing the scones, and then sift flour and salt (wholemeal is not sifted, of course), and rub in the butter, lifting the flour high as you work. Make a depression in the centre, and gradually pour in the milk, mixing with the blade of a pliable knife. Mix quickly and lightly to a rather soft dough, softer than you would make for pastry. Knead this lightly into a round shape (really, it is just a quick tidying), and then press the dough out lightly to about 1 in. in thickness. Cut into rounds or squares, place on cold floured tray, and brush over the tops with a spot of beaten egg to give a glossy finish. Bake at once in a very hot oven for about eight minutes. If the scones take longer than 10 minutes to cook and brown nicely, you will know that the oven is not sufficiently hot for the best results. With wholemeal, see that the dough is a little softer than that used for white scones, and give it a few minutes longer in the oven.

Mock Duck.

One pound blade bone (or rump) steak, 1 cup breadcrumbs, 1 teaspoon chopped parsley, 1 teaspoon mixed spice, 1 chopped onion, 1 tablespoon melted butter, salt and pepper to taste, good dripping and hot water. Pound the meat a little and rub with lemon. Mix breadcrumbs and seasoning, and add melted butter. Place over the meat, roll up and tie into shape. Place in casserole with some good dripping and a cup of hot water. Bake about two hours in a moderate oven, then remove cover from dish and allow 20 minutes more cooking to allow ''duck'' to brown. Serve with good gravy.

Sugarless Gingerbread.

Two teacups sifted flour, ½ teaspoon salt, 3 teaspoons baking powder, ½ teaspoon ground ginger, 2 oz. beef, lamb, pork or poultry dripping, 1 egg, ¼ teaspoon ground cloves, 4 tablespoons milk, ¾ teacup golden syrup, 2 oz. chopped dates, raisins or candied peel, ¼ teaspoon ground cinnamon. Sift dry ingredients into a basin. Melt fat. Stir in milk and beaten egg. Gradually beat into dry ingredients, then stir in syrup and fruit, or peel. Bake in a shallow greased baking tin in a moderate oven for 30 to 40 minutes.

Apple and Cheese Scallops.

Three-quarters teacup stale breadcrumbs, 4 large apples, 2 teacups grated cheese, salt to taste, milk as required, 2 tablespoons butter. Grease a baking dish well, then line it with quarter teacup of the crumbs. Peel, core and cut apples into thin slices. Place a layer of apple in the bottom of a dish. Cover with about half a cup of cheese. Season with salt. Repeat three more layers of apple and cheese. Season each layer with salt. Cover with milk. Sprinkle with remainder of crumbs. Dab here and there with butter. Bake in a moderate oven for about half an hour or until apples are soft. Enough for six persons.

Quick Fish Cakes.

One jar fish paste, 2-3 drops anchovy essence, 2 breakfastcups mashed potatoes, 1 tablespoon chopped parsley, pepper to taste, 1 egg, 2-3 tablespoons fine breadcrumbs, 2 walnuts of fat. Beat the fish paste and anchovy essence to gether, then mix in with the potatoes and parsley. Season with pepper. Taste, and if necessary, add a little salt. Add the egg, or enough of it to bind the mixture together. Form into round cakes, less than ½ in. thick, dip in milk, roll in the crumbs, and fry both sides to a golden brown in the hot fat.

QUEENSLAND WEATHER IN OCTOBER.

Rainfall distribution was above average in the Central Coast West, Central Lowlands and Highlands, Darling Downs, Maranoa, and Far South-west. Other districts aggregates ranged from slightly under normal to deficiencies of 50 per cent. and over in the Central Coast East, North Coast Herbert and Peninsula. The Central Coast East district with an average of only 23 points was 82 per cent. below normal, and several stations had no rain. In the Carpentaria and Peninsula, distribution also ranged from Nil to scattered storms, but in general pastoral prospects continue to be very favourable, especially in central and southern districts. In the dairying and agricultural areas of the south-east and coastal divisions, the central coast received the least benefit in the otherwise bountiful September rain distribution. During October the Maranoa and Downs areas averaged from over 2 to 3 inches, as the result of a succession of variable storms. Intervening finer spells were somewhat humid, and with harvesting already commencing in some districts dry weather is required to decrease risk of possible rust and storm damage and relieve anxiety with regard to the anticipated record of over a 10,000,000-bushel wheat crop.

Pressure controls showed the seasonal succession of east to west movement of fairly substantial highs separated by inland troughs and southern low combinations. The southern centres showed considerable activity at times, but in Queensland most of the rain production from trough and associated cold front action was confined to the south-east districts of the State, and local afternoon and evening thunderstorm periods accompanied the seaward movement of the trough.

Moderate south-east weather was experienced along the coast 8th, 13th and 14th, 18th to 20th, with moderate to rather rough patches 25th to 27th.

Temperatures.—Maximum temperatures were generally well below average, from 1.8 degrees at Palmerville, to 4.6 degrees at Mitchell, and 4.7 degrees at Longreach. Minimum figures were about normal, from minus 0.7 degrees at Georgetown to plus 1.3 degrees at Boulia. The highest daily maximum temperature 103 degrees was recorded at Normanton 11th and 12th and Camooweal and Urandangie 13th. Lowest terrestrial readings were at Stanthorpe—29 degrees (6th), 31 degrees (7), 30 degrees (11th).

Brisbane.—Mean pressure 30.029 inches (normal 30.008 inches). *Temperature.*—Mean maximum 76.3 degrees (normal 79.1 degrees), second lowest on record; 75.0 degrees in 1934, 76.4 degrees in 1946. Mean minimum 59.3 degrees (normal 60 degrees). Mean temperature 67.8 degrees (normal 69.7 degrees). Highest daily 85.7 degrees on 8th. Lowest daily 54.3 degrees on 8th. *Rainfall.*—366 points on 11 days. (Average 259 points on 9 days). *Sunshine.*—260.0 hours (normal 215 hours). *Highest Wind Gust.*—S.S.W. 55 miles per hour on 9th.

The rain position is summarised below—

Division.	Normal Mean.	Mean October, 1947.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	45	15	67 below
Peninsula South	70	25	64 „
Lower Carpentaria	52	30	42 „
Upper Carpentaria	76	58	24 „
North Coast Barron	133	126	5 „
North Coast Herbert	178	93	48 „
Central Coast East	129	23	82 „
Central Coast West	77	91	18 above
Central Highlands	146	169	16 „
Central Lowlands	98	167	70 „
Upper Western	60	49	18 below
Lower Western	71	61	14 „
South Coast, Port Curtis	208	158	24 „
South Coast, Moreton	274	237	14 „
Darling Downs, East	223	297	33 above
Darling Downs, West	165	225	36 „
Maranoa	161	287	78 „
Warrego	110	88	20 below
Far South-West	86	105	22 above

Commonwealth of Australia, Meterological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

DECEMBER.

Supplied by W. J. Newell, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.45	6.28	Cairns	51	7	Longreach	44	26
6	4.46	6.32	Charleville ..	30	24	Quilpie	33	37
11	4.47	6.35	Cloncurry	65	35	Rockhampton ..	19	1
16	4.49	6.38	Cunnamulla ..	27	32	Roma	19	15
21	4.51	6.41	Dirranbandi ..	16	22	Townsville ..	42	8
26	4.54	6.43	Emerald	28	11	Winton	52	29
31	4.56	6.46	Hughenden ..	49	21	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Day.	Rise.	Set.
	p.m.	a.m.
1	9.43	7.04
2	10.38	8.12
3	11.25	9.21
4	..	10.28
	a.m.	
5	12.06	11.33
		p.m.
6	12.42	12.35
7	1.15	1.35
8	1.47	2.33
9	2.20	3.31
10	2.54	4.30
11	3.30	5.29
12	4.11	6.27
13	4.56	7.13
14	5.45	8.16
15	6.37	9.04
16	7.31	9.46
17	8.26	10.23
18	9.21	10.57
19	10.15	11.29
20	11.09	11.59
	p.m.	
21	12.02	..
		a.m.
22	12.57	12.28
23	1.54	12.58
24	2.55	1.31
25	4.00	2.09
26	5.09	2.52
27	6.19	3.43
28	7.25	4.43
29	8.26	5.51
30	9.18	7.03
31	10.03	8.14

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	10	30	25	45	0	21	27	53
6	16	21	31	37	7	12	36	43
11	27	12	43	26	18	1	50	29
16	29	11	45	26	20	1	52	29
21	19	19	36	35	10	10	41	40
26	11	28	26	43	0	19	28	51
31	13	26	29	42	3	18	32	50

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	5	55	35	67	19	52	5	45
3	12	49	38	63	23	49	11	41
5	17	44	41	60	26	46	15	37
7	27	28	49	49	33	34	23	24
9	38	17	56	42	41	27	45	16
11	47	8	63	36	47	21	39	8
13	54	3	67	32	51	18	44	4
15	54	4	67	33	51	19	44	5
17	50	10	64	37	48	23	41	10
19	42	19	58	43	43	28	35	17
21	32	29	52	50	36	35	26	25
23	21	34	44	54	29	39	18	29
25	11	44	38	60	23	46	10	37
27	5	52	35	65	19	50	5	44
29	6	53	35	66	20	51	6	44
31	15	46	40	61	25	47	14	38

Phases of the Moon.—Last Quarter, December 5th, 10.55 a.m.; New Moon, December 12th, 10.53 p.m.; First Quarter, December 21st, 3.43 a.m.; Full Moon, December 28th, 6.27 a.m.

Solstice, December 23rd.—The Sun will then have reached its maximum angle south of the Equator and will rise and set about 25 degrees south of true east and true west respectively.

On December 7th and 21st the Moon will rise and set approximately at true east and true west respectively.

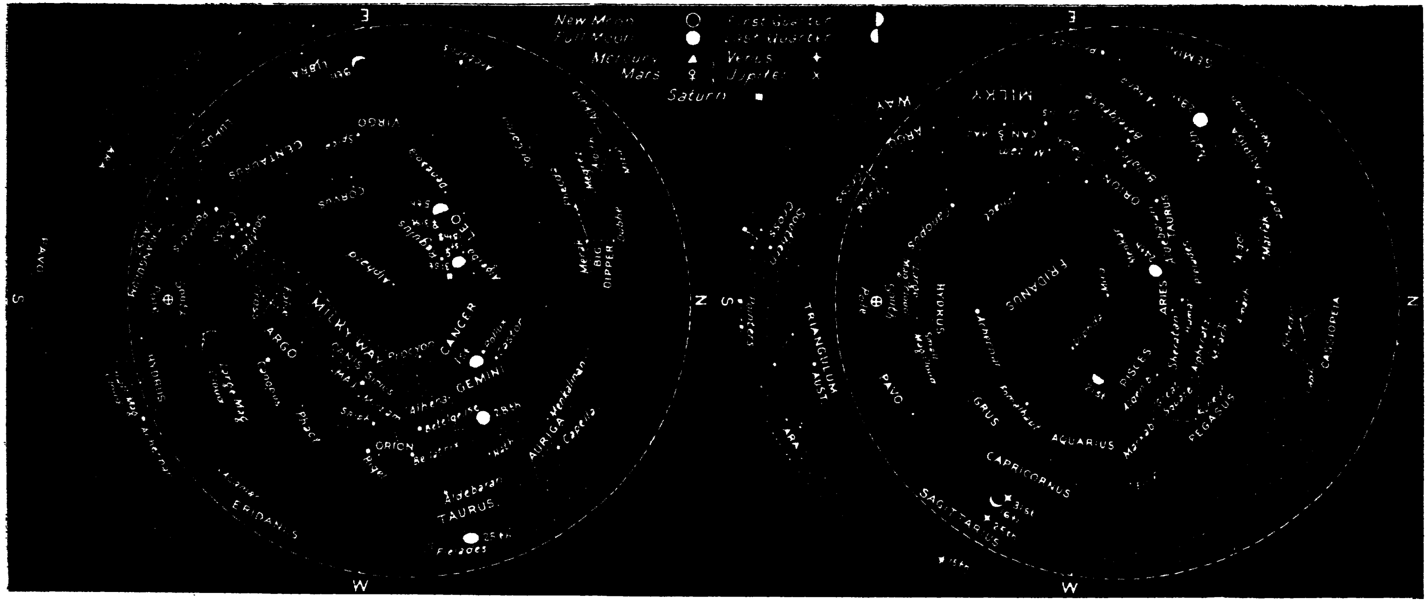
Mercury.—A morning object all this month. At the beginning of December, in the constellation of Libra, will rise about 1 hour before the Sun, and on the 13th will pass about 5 degrees to the north of Antares, while on the 15th it will pass less than 1 degree south of Jupiter. At the end of the month it will rise about 15 minutes before the Sun.

Venus.—Now a brilliant object in the western evening sky. At the beginning of December, in the constellation of Sagittarius, will set between 8 p.m. and 9.15 p.m., and at the end of the month, in the constellation of Capricornus, will set between 8.30 p.m. and 9.45 p.m.

Mars.—In the constellation of Leo, will rise about midnight at the beginning of December and between 10.15 and 11.15 at the end of the month.

Jupiter.—Will be in line with the Sun on December 1st and will not be visible until the end of the month, when it will rise one and a half hours before the Sun and may be seen low in the east during morning twilight.

Saturn.—In the constellation of Leo, will rise about midnight on the 1st and between 9.15 p.m. and 10.30 p.m. on the 31st.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th December. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 7 hours later. On each chart the dashed circle is the horizon as viewed from Cape York, and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month, the stars will be in the positions shown about 1 hour later than the time stated for the 15th, and at the end of the month about 1 hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

OCTOBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1946.	Oct., 1947.
North Coast.	In.		In.	In.
Atherton	0·90	42	1·26	2·57
Cairns	2·06	61	0·17	2·44
Cardwell	1·95	71	0·63	2·35
Cooktown	1·00	67	Nil	0·53
Herberton	0·93	57	0·93	0·81
Ingham	1·80	51	0·38	0·66
Innisfail	3·12	62	0·37	1·53
Mossman	2·59	19	0·69	2·74
Townsville	1·25	72	0·06	0·11
Central Coast.				
Ayr	0·87	56	0·06	0·11
Bowen	0·97	72	0·09	0·24
Charters Towers	0·71	61	Nil	0·19
Mackay	1·76	72	0·38	0·90
Proserpine	1·53	40	0.31	0·80
St. Lawrence	1·76	72	0·33	0·15
Central Highlands.				
Clermont	1·28	72	0·23	1·27
Springsure	1·62	74	0·07	1·85
South Coast.				
Biggenden	2·49	44	2·28	2·99
Bundaberg	2·07	60	2·13	1·22
Brisbane Bureau	2·59	94	2·51	3·66
South Coast—contd.	In.		In.	In.
Caboolture	2·73	67	3·28	2·68
Childers	2·71	48	1·05	1·31
Crohamhurst	3·38	50	5·33	..
Esk	2·60	56	1·92	2·15
Gatton College	2·06	44	1·78	1·99
Gayndah	2·37	72	1·78	2·83
Gympie	2·73	73	2·62	1·70
Kilkivan	2·68	62	1·99	1·69
Maryborough	2·73	72	1·24	1·44
Nambour	3·23	47	3·46	1·94
Nanango	2·19	61	1·86	3·51
Rockhampton	1·78	72	1·80	0·85
Woodford	2·53	55	3·45	2·84
Darling Downs.				
Dalby	2·01	73	0·32	2·77
Emu Vale	2·18	47	1·75	2·45
Jimbour	1·88	64	0·55	2·27
Miles	2·00	58	0·61	2·77
Stanthorpe	2·50	70	2·11	3·99
Toowoomba	2·54	71	2·21	2·52
Warwick	2·32	78	2·04	3·79
Maranoa.				
Roma	1·73	69	0·87	2.27
St. George	1·29	62	0·09	3·31

CLIMATOLOGICAL DATA FOR OCTOBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	83	68	89	25	59	7	244	7
Herberton	..	79	59	90	9	43	6	81	8
Townsville	..	83	67	89	24	55	7	11	3
Rockhampton	30·05	83	61	91	9	48	6	85	4
Brisbane	30·08	76	59	86	8	54	8	366	11
Darling Downs.									
Dalby	..	78	53	88	2	44	6	277	6
Stanthorpe	..	70	46	79	22	34	6	399	7
Toowoomba	..	72	52	84	22	38	25	252	7
Mid-Interior.									
Georgetown	29·94	94	67	98	10, 11	50	6	11	2
Longreach	30·03	88	62	97	9	42	6	197	6
Mitchell	30·04	80	54	91	1	42	6	315	10
Western.									
Burketown	..	92	69	102	11	54	6, 7	Nil	Nil
Boulia	29·94	91	65	102	13	48	6	22	3
Thargomindah	29·98	83	61	95	19	48	5	98	4

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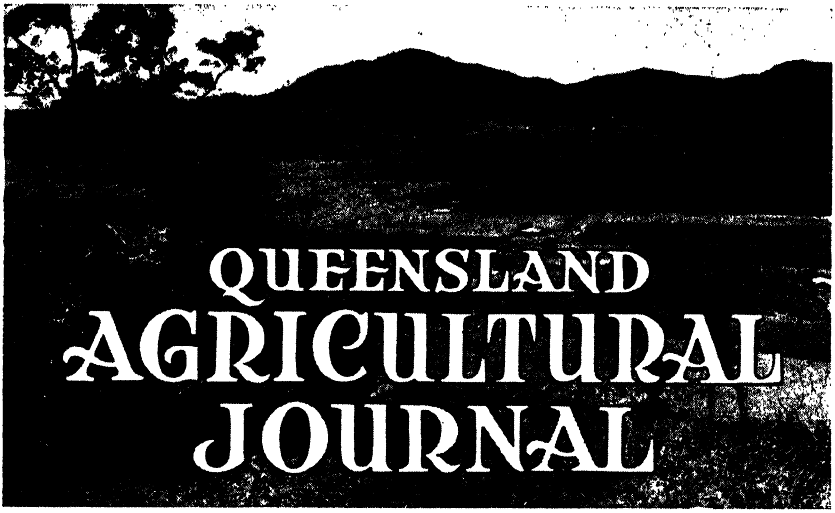
Contents

ANNUAL RATES OF SUBSCRIPTION.—Queensland Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



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Event and Comment.

Veterinary Services.

CO-OPERATION among farmers has frequently solved shortage of man power, stated the Minister for Agriculture and Stock (Hon. H. H. Collins) in the course of a recent announcement. At the present time, he said, there is a world-wide shortage of veterinary surgeons, and the position in Queensland is comparable with that of other countries. It is therefore obvious that existing veterinary services, whether they are governmental or private, should be used to the best advantage of the stock owners generally. It is suggested also that for such operations as calfhood vaccination with Strain 19 for protection against contagious abortion, farmers should co-operate to arrange for a large number of calves to be available on the one day in any particular district, so that the visit of the veterinary surgeon will be worth while and the whole of his time occupied. Government veterinary officers are not always available for this work, but if sufficient calves can be made available the Department may be able to arrange for a private veterinary surgeon to carry out the work.

Crossbred Sheep.

A SCHEME to foster the breeding of crossbred sheep in Queensland was announced by the Minister for Agriculture and Stock (Hon. H. H. Collins) recently. Mr. Collins pointed out that the fat lamb raising in this State is as yet a small industry, and its development is seriously retarded by the shortage of crossbred ewes suitable as lamb mothers. The "ideal" mother is the ewe from a first cross between a Merino ewe and a longwool ram such as a Border Leicester, Romney Marsh, or Corriedale; accordingly, assistance is to be given to a limited number of sheep raisers who wish to introduce rams of these breeds

into what might be regarded as the marginal lamb-growing areas. It is anticipated that the male offspring from such crossbreeding can be turned off by the farmer as heavy weight lamb or young mutton.

The assistance envisaged may take the form of a subsidy for the purchase of longwool flock rams, or may involve the actual purchase of the rams by the Department and their subsequent use by farmers. In the latter case, however, recipients of sheep will be called upon to enter into an agreement not to sell any surplus female offspring other than as fat lamb mothers in recognised lamb-raising areas.

The objects of the scheme, said Mr. Collins, are to improve the quality of lambs produced in Queensland as well as to increase production of lamb.

The Tobacco Industry.

IN the course of a recent radio interview, the Minister for Agriculture and Stock, Hon. H. H. Collins, remarked that as circumstances had compelled us to cut down on our dollar expenditure, an unparalleled opportunity to expand our production of tobacco leaf had presented itself. Having all the essential requirements of the tobacco plant and the capacity to produce leaf comparable with the world's best, there was no reason, he said, why, in due time, the home demand should not be fully supplied. Production could be increased by adding to the present acreage, by getting more from every acre in established tobacco districts and by extending tobacco growing to other districts where the soils and climate were suitable and where there was enough water to irrigate the crop. The Minister added a note of caution, however, on the ground that the position with which we are now faced does not call for the wholesale production of any sort of leaf on unsuitable soil types by inexperienced growers who might misguidedly think that they now had a splendid opportunity of "making hay (or tobacco) while the sun shines." Too many, bidding to cash in on a scarcity, had made that mistake in past years.

In any plan for increasing production, the objective should be an all-round improvement in the quality of the leaf, said Mr. Collins. Of equal importance was the continuity of high quality production which, in turn, would mean stability within the industry. Seasonal conditions would, of course, always influence leaf quality, particularly that of rain-grown crops. The advantages of irrigation were obvious, but there was more in irrigation than merely watering the tobacco plant and the quality and yield of a crop depended a lot on how, when and in what volume water was applied. The quality of the water and its effect on particular soil types also had to be considered. Such details as colour, structure and composition of the leaf also were of great importance in determining the commercial value of the product. In all these things Queensland tobacco growers were assured of the technical advice and assistance of the Department of Agriculture and Stock, from the selection of suitable tobacco land to the preparation of cured leaf for market.

Continuing, Mr. Collins said that during the past 20 years the Department had carried out much research and extension work. The Department and the growers were closely associated in the industry and, in collaboration with the Council for Scientific and Industrial Research, it was now engaged on a concentrated effort to increase the production of the best quality leaf with the object of growing sufficient ultimately to meet the domestic demand and of ensuring the future of tobacco growing as a great Australian industry.

A Home Made Level.

A. F. SKINNER, Soil Conservation Officer, Bureau of Investigation of Land and Water Resources.

Making the Level.

THIS home made level (Plate 130) consists essentially of a large "U" tube (made from two glass tubes connected with a rubber hose). When this is partly filled with water or spirit, and when both ends are open, the surface levels of the fluid in the two vertical glass columns will be similar, irrespective of the angle or position of either the base board or the tripod stand.

When the base board, on which the "U" tube assembly is mounted, is rotated around its central pivot it will be apparent that the surface levels of the two opposite columns of fluid will also rotate on the one horizontal plane, even if the base board is not level. It will thus be seen that the device is self-levelling and that, in the field, a succession of levels can be determined from any one station without making any adjustment to the instrument.

The diameter of the glass tubes should be sufficient to facilitate free movement of the fluid used and thereby to eliminate possible error due to adhesion of the water to the surface of the tubes. A minimum internal diameter of an inch is suggested for this reason, although satisfactory results have been obtained with slightly smaller sized tubes. Certain types of long and narrow bottles, such as are commonly used for castor or olive oils, may be used if other material is not available. In such cases the bottoms should be removed, the bottles inverted, and the necks inserted through the holes in the base board. The distance between these holes and also the dimensions of the base board, as shown in the diagram, are approximate only, and may be modified slightly if necessary without losing efficiency.

If desired the fluid may be coloured to facilitate visual work.

Using the Level.

In use, levels are sighted across the tops of the two opposite columns of fluid in the glass tubes on to a sighting target on a graduated staff. No attempt should be made to sight *through* the glass. Turn the base board to a slightly diagonal position and sight *between* the two columns as shown in Plate 131 (lower right hand corner).

To set out either contour or grade lines or for other levelling work the standard practice of taking backsights and foresights is followed.

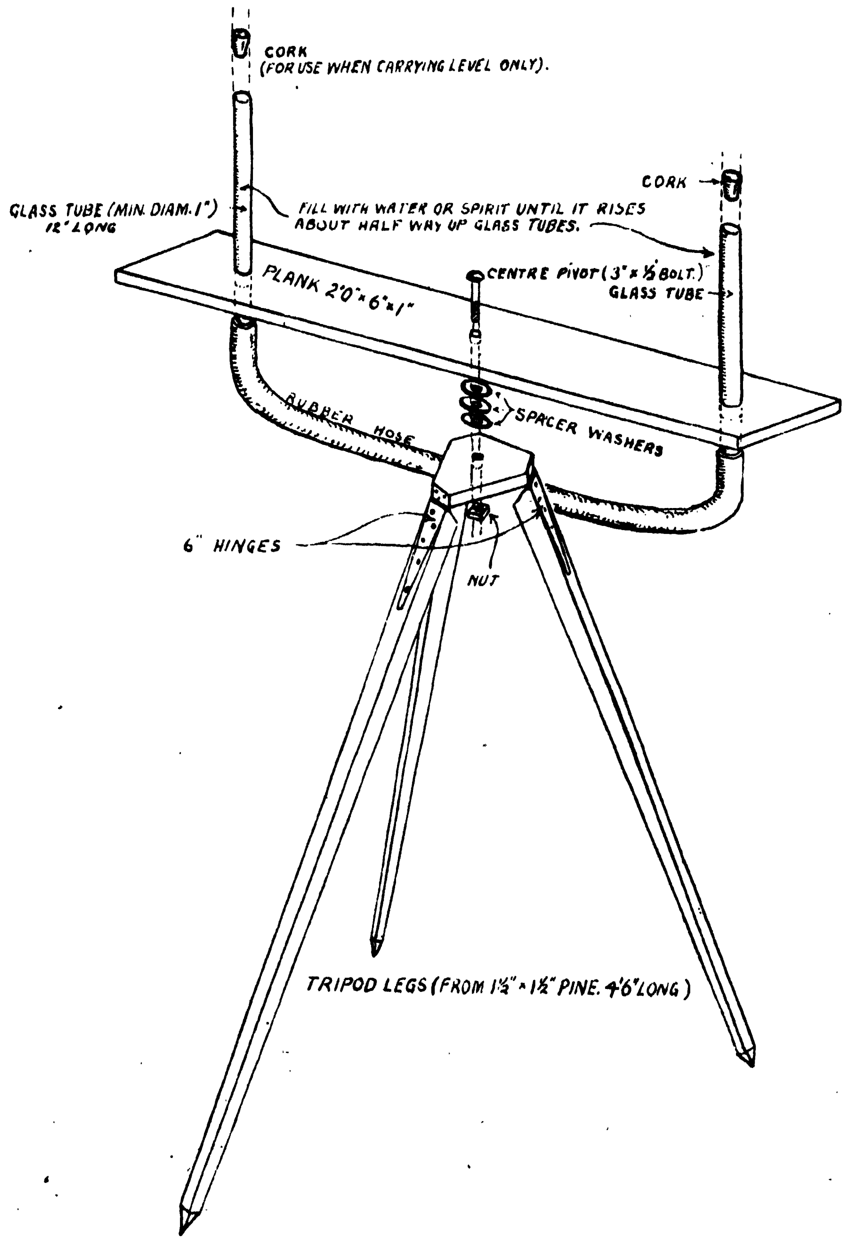


Plate 130.

If a contour (level) line is required the staff (bearing the sighting target in an approximately central position) is held in an upright position by an assistant at a selected starting point. The level is then set in a position in the field at a distance of several hundred feet from the staff and from where the line of sight over the surface levels of the columns of fluid approximately intersects the target. Several trials may

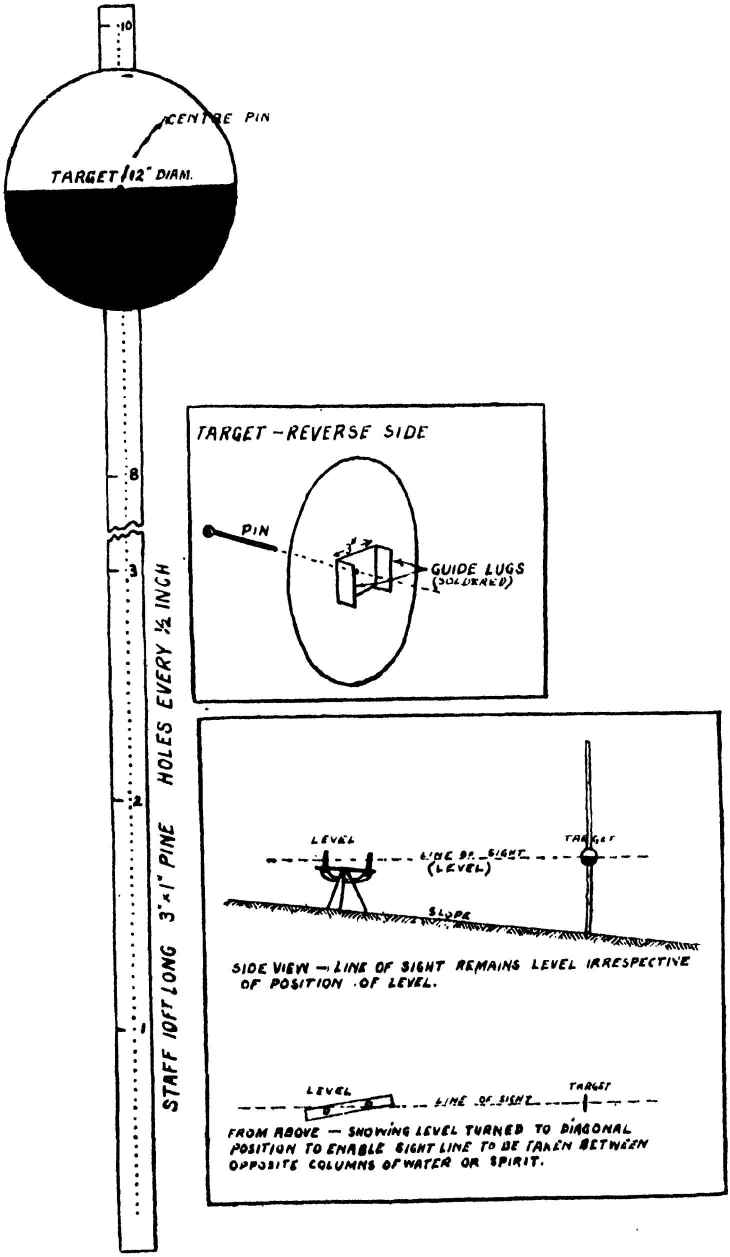


Plate 131.

at first be necessary before a suitable station is located. The next step is to adjust the position of the target on the staff until the line of sight intersects the exact centre of it. The target is attached to the staff by means of a wire pin. It also has two guiding brackets on it to prevent it from rotating on this pin.

The back of the staff is graduated in half inches and the position of the target on the staff should be noted by the assistant after its position has been adjusted.

After marking the starting position with a peg or a piece of white paper (a roll of toilet paper carried at the waist is time-saving in this respect) the staff is carried forward a measured distance (e.g. 100 ft.) and again held upright. A sight is again taken by the operator of the level and the staff is moved either up or down the slope until the line of sight again intersects the exact centre of the target. The latter obviously must not be moved on the staff when plotting a succession of points of equal height.

The process is repeated a number of times until finally difficulty is encountered in clearly seeing the target. At this stage the assistant with the staff should remain at the last peg while the level is moved to a new station beyond the staff. A new position for the target on the staff is then determined in the manner already described and the whole procedure is repeated as before.

It is mentioned that the distance between points at which staff measurements are made will vary considerably according to the degree of accuracy required, the general nature of the topography of the land, and also with the condition of its surface.

For accurate work on broken ground intervals of 50 feet, with some interspace measurements, will satisfy most requirements. On unbroken rolling downs or on open plain country, very much wider spacings may be used. When locating true contours, as distinct from grade lines, the uniform spacing of points of measurement is not necessary.

For setting out grade lines the procedure is somewhat similar to that described above, but the position of the target on the staff must be altered at each point of measurement and the distances between points must be measured accurately.

An Example.

To indicate more precisely the procedure to be followed let it be assumed that it is desired to set out a line with a gradient of 3 inches per 100 feet of length, that the selected starting point is to be the lower terminal of the line, and that the height of the target on the staff at which the line of sight intersects its centre is 5 ft. 7½ in. A point to be located at a radial distance of 50 feet from the starting point will therefore require to be 1½ inches higher than that point; at 100 ft., 3 inches higher; at 150 ft., 4½ inches higher, and so on. To obtain this gradient the target should be *lowered* a corresponding amount on the staff. That is, it should be lowered from 5 ft. 7½ in. (at the starting point) to 5 ft. 4½ in. before the first point at a distance of 100 ft. can be located.

If a fall is required the procedure is reversed, that is, the target is *raised* the desired amount on the staff.

Proportionate adjustments should be made for the measurement of the elevation of points at distances either greater or less than 100 feet.

With a little practice both speed and accuracy can be developed in using this level which, although lacking many of the advantages of more expensive precision instruments, will, nevertheless, serve many useful purposes on any farm or pastoral holding.

The Year in Agriculture.

In his report to the Minister, Hon. H. H. Collins, M.L.A., the Under Secretary, Mr. Arthur F. Bell, presented a comprehensive review of the activities of the Department of Agriculture and Stock for the year ended 30th June last, together with a general appraisal of the agricultural and livestock situation in Queensland. Subjoined is a summary of Mr. Bell's report.

SEASONAL CONDITIONS.

THE April-September period of 1946 was exceptionally dry and without sufficient rain for successful sowings of seasonal crops. Some relief came in late September with soaking rains over the south-eastern division. Lighter falls were recorded in some pastoral districts, but, except for isolated showers, there were few beneficial falls in other parts of Queensland.

Aggregate rain registrations in October were below normal throughout the State. Fairly well distributed storms occurred in some of the southern agricultural areas, but in other districts only very light rainfalls were recorded. November was a month of storm rains over a wide expanse of the far-western pastoral country. In the South-west, however, there was practically no break in the protracted dry weather. Local thunderstorms improved the seasonal outlook in agricultural and dairying districts. December rainfall was below normal in most divisions of the State.

In January the rainfall distribution was light over most of the pastoral districts, but under cyclonic influences there were very heavy downpours in the south-eastern division. In some localities registrations were phenomenal and there were serious inundations in the basins of seaward-flowing rivers. February was another month of excessive rainfall aggregates and consequent high floods in the coastal districts. The South-west had the best rains for years, which altered entirely the pastoral outlook in that region. A second heavy flood series commenced in the coastal districts near the end of the month and continued into the first week in March. March also was a month of generous rains and the South-west again shared in the benefit, some streams reaching flood reporting levels. Throughout other divisions of the State most rivers and their tributaries were either in flood or flowing strongly. There were flood rises in most of the coastal river systems and also in the basins of some inland streams. April rainfall was above normal in the South Coast, Moreton, and Darling Downs divisions and caused more local flooding. The most useful May rains fell late in the month and extended from the seaboard to the Warrego and central highlands. In the wheatgrowing areas sowings for grain commenced on a record acreage—500,000—for Queensland.

At the close of the year, seasonal prospects were good as a result of the late summer rains and recent freshening falls and in most districts stock were wintering well. Light to useful rains in southern

and far south-western pastoral districts spread eastwards through the Warrego, Maranoa, and Darling Downs divisions to the South Coast, but, except on the tropical coast, gaugings were below the light to moderate July averages. Normal dry winter weather was the general experience; however, crop prospects were promising in every farming district.

PLANT INDUSTRY.

A perusal of the several reports covering the activities of the Division of Plant Industry will show that, in spite of the somewhat unsatisfactory nature of the seasonal conditions, a great deal of useful work was carried out by the officers handling both the investigational and advisory services.

Many crops grown in Queensland are either produced commercially nowhere else in Australia or are predominantly Queensland-grown. As a consequence, the Department of Agriculture and Stock has, in large measure, to rely on its own efforts to solve the problems of these crops and in handling them can draw only to a limited extent on experience gained elsewhere. This has led to the building up of a considerable team of workers recruited specially for investigational work. Much of the work of some of these officers can be done in the Head Office laboratories in Brisbane and, to some extent, in co-operation with farmers, orchardists, and market gardeners on their own properties. On the other hand, many of the projects on which it is desired to concentrate their efforts can best—and in some cases can only—be satisfactorily handled on departmentally controlled properties. It was for this reason that the recent departmental reorganization provided for the establishment of a number of regional experiment stations with which are now associated several branch stations. The important part played by these various stations in the departmental investigational programme is very evident from this year' annual report; and the plans which have been prepared for their further development imply that, within the course of a few years, each of these several stations will function as a major centre of plant industry activities within its district.

Soy Bean.—The potential importance of the soy bean in Queensland's rural economy has led to the establishment of observation plots in various districts, these plots containing well over 100 varieties. The report of the Commonwealth Commission of Investigation into the Soy Bean Industry in the United States of America—one of whose members was the Director of Agriculture—has now been made available. It contains a very comprehensive assessment of the status of the soy bean industry in North America and of its possibilities in Australia. Another crop which may have possibilities in Queensland is rice and, here again, seed of a considerable range of varieties has been obtained from overseas. These are being tested as an essential preliminary to the possible establishment of rice-growing in certain districts in the State.

Fertilizer and Varietal Trials.—As in previous years, the experimental programme on established field crops covered a very wide range of fertilizer and varietal trials. Another important feature of the activities of the field officers was their participation in a seed selection programme covering maize, wheat, grain sorghum, peanuts, and tobacco. This important seed selection work has now been supplemented by a seed certification scheme which already provides for hybrid maize, sorghum, and beans.

Plant Breeding.—Plant-breeding activities in field crops have been maintained more or less on the same basis as in previous years, except for the fact that improved facilities are now available for handling this type of work in the case of wheat, oats, and sorghum at the Hermitage Regional Experiment Station outside Warwick. Attention is directed to an article to appear in the August, 1947, issue of the *Queensland Agricultural Journal* in which departmental progress in wheatbreeding during the 1946-47 season is discussed. The illustrations contained therein may be regarded as striking evidence of the promising nature of the material at present being produced and tested in the case of this valuable field crop.

Storage and Transport Problems.—One of the most important recent developments in the horticultural activities of the Department has been the initiation of extensive work on fruit and vegetable storage and transport problems. Satisfactory progress has been made in this investigational sphere which is of particular importance in a tropical and subtropical State such as Queensland.

Pest Control.—The work of the several sections of the Science Branch also has been attended with a considerable measure of success. Naturally, further possibilities of new insecticides, such as DDT and Gammexane, have been investigated by the entomologists of this branch, as also have new fungicides by the Plant Pathology Section.

Agricultural Chemistry.—The Chemical Laboratory is playing a part of growing importance, particularly in the realm of soils, irrigation waters, and biochemical problems. Land settlement projects for ex-servicemen have placed an increasingly large measure of responsibility on the Plant Nutrition Section of this branch. This responsibility, involving as it does a great deal of soil surveying and analytical work, which has been carried out in co-operation with officers of several branches, has been discharged with a marked degree of efficiency. It can be claimed that every precaution which can be taken by this Department to ensure that new areas made available for settlement have a reasonable prospect of success is being observed. The biochemical work is being steadily developed because of its obvious great importance to the herds and flocks of what is still—and is likely to remain largely—a primary producing State.

Tropical Agriculture.—The main activities of the Bureau of Tropical Agriculture included the establishment of pastures for grazing trials, designing of paddocks and water supplies, and the introduction of grasses and legumes and their further increase for seed supply. In addition, various tropical crops have been grown and the details of their behaviour recorded.

Agricultural Research.—Agricultural research work of the year included winter cereal breeding; cotton breeding and pest control; field trials with potatoes, oats, maize, lucerne, tobacco, sorghum, soy bean, and cow pea; and seed selection—wheat, maize, rice, sorghum, peanut, and tobacco.

Advisory Work.—No reference to the work of the Plant Industry Division would be complete without mention of the very great volume

of advisory work which is handled both by the Head Office staffs and by the staffs of the various branches located at different country centres. These officers whole-hearedly discharge a very worthwhile service to the primary producers in their various districts. The work perfomed by them contributes very largely to the success of the Department and to the esteem in which it is held by the general body of primary producers.

The policy of providing improved accommodation for departmental officers at country centres—which was of necessity suspended during the war years—has been continued during the year under review. The latest improvement is at Toowoomba, where the officers of the Science Branch now occupy commodious and well-equipped laboratories. The field officers of the Division of Plant Industry and other departmental officers stationed at Towoomba have also been supplied with markedly improved office accommodation at that centre.

Field Crop Production.

Sugar.—Final sugar production figures for the 1946 season, as supplied by the Sugar Board, show that 512,086 tons of 94 n.t. sugar were manufactured. This figure is 132,503 tons short of the 1945 production following a prolonged dry period in all sugar districts and serious frosts in the southern and central areas. In only one of the war years was a lower production figure recorded. The quantity of cane harvested was 3,714,475 tons and consequently 7.25 tons of cane were required to make 1 ton of 94 n.t. sugar. This is only the fourth occasion in the past 16 years on which more than 7 tons of cane have been required. The c.c.s. value of the cane was 13.89, an exceptionally low figure and caused largely by continuous dry weather and frost-damaged cane. This low quality is reflected in the tons of cane required to manufacture 1 ton of sugar.

The average price for the 1946 sugar crop was £21 16s. 10d. per ton, an advance of £1 10s. 9d. per ton on 1945 figures (compared with £19 16s. 1d. in 1944). The total value of the crop was, therefore, £12,160,000 compared with £13,000,000 in 1945.

The 1947 crop is estimated to produce 3,900,000 tons of cane, and this should yield 550,000 tons of sugar. This figure, if achieved, will be a distinct advance on 1945 production, but will not be up to 1944 manufacture and will be a long way behind pre-war peak years. Crop estimates are improving as the result of the early spring rains, and it is probable that the estimate of 1947 production is somewhat conservative.

Wheat.—Weather conditions from the time of sowing until mid-September were very dry with a succession of heavy frosts. Practically all the early and mid-season sowings, which constituted most of the area planted, failed for grain and were grazed off.

After the September rains, some sowings were made and despite the lateness of the season yields of up to 18 bushels per acre were obtained. In some circumstances, the behaviour of these late-sown crops

was remarkable as they showed little or no signs of rust and developed good quality grain. The total yield, however, was only about one million bushels, the lowest for 20 years.

As has been the experience for several seasons, varieties bred by the Department of Agriculture were outstanding and filled the first seven places in a census of wheat varieties planted in Queensland this season.

One unnamed crossbred (Three Seas x Florence x Kenya 6041) again demonstrated its resistance to rust and also yield capacity under adverse conditions and may prove to be the best of many excellent varieties bred by the Department.

Maize.—The yield on the whole was not good because of an increased acreage of grain sorghum and also seasonal conditions. In most districts early-sown crops were poor, consequently most of this season's grain will come from the late-sown crops which on the whole were much better.

On the Atherton Tableland an area of approximately 24,000 acres was sown for an estimated yield of between 18,000 and 19,000 tons.

Grain Sorghum.—Both acreage sown and total yield were easily a record. It is anticipated that the yield will be between three and four million bushels of grain. This crop is progressively increasing in popularity, and while this is to some extent the reason for the record acreage sown, the fact that large areas which normally would be under wheat were available for sowing with grain sorghum also was a factor.

Potatoes.—The potato crop in southern districts was the lowest since the contract scheme came into operation in 1942. The spring crop was light because of the dry weather, and it was only in localities where irrigation is practised that satisfactory yields were obtained. The autumn crop was very light because of excessive wet during February and March.

In North Queensland, it has been necessary to reduce the area under potatoes since Defence Force demands ceased. It is hoped, however, that it will be possible to maintain the industry at its present level of sufficiency for the requirements of the population north of the tropic of Capricorn. The crop for the past season in the Burdekin district was satisfactory in both quantity and quality.

Moth attack, which is usually severe towards the end of the season, caused only minor damage. Growers who used the insecticide DDT were highly satisfied with the result. The varieties Bismarck and Brownell were the most widely grown, but Factors also are gaining favour.

Tobacco.—The area under tobacco was greater than that of the previous season. In the Mareeba and Dimbulah districts. the season was not very favourable for non-irrigators. In the dry-farm areas no trouble was experienced in geting good strikes in the field, and although the crops continued to look promising curing difficulties arose because of the seasonal conditions. The rainfall during January was the lowest for over 70 years. February rains were normal, yet insufficient to compensate for the lack of moisture during the previous months. Blue mould did not show up at all during the season and mosaic was less severe than usual.

The total area planted was 1,361 acres—738 acres in the Mareeba district and 623 in the Dimbulah district. It is expected that approximately 950,000 lb. of cured leaf will be appraised for the season.

In the south-western districts the area planted was greater than that of the previous season. Conditions were favourable for the raising of seedlings, and after planting out had been completed large numbers of seedlings were still available. Crops made very good growth. DDT was used extensively in the seed-beds, with the result that seedlings were remarkably free from insect injury. The area planted was 865 acres for an estimated yield of approximately 928,000 lb. of cured leaf.

Peanut.—A record peanut acreage was planted, the area being over 40,000 acres—50 per cent. greater than any previous acreage planted. The estimated yield is 20,000 tons. There was an expansion of the industry not only in the South Burnett but also in the Upper Burnett and on the Atherton Tableland.

Canning Bean.—The area cropped was below that of previous seasons, but yields generally were excellent, and it is anticipated that the yield will be equal to if not greater than that of any previous season. Yields of up to 33 bushels per acre were obtained in the Kingaroy district. The quality was excellent.

Sunflower.—The area under sunflower increased because of a ready market for all seeds with a high oil content. The increase in acreage also has been influenced by the introduction of the short-growing varieties, Mannonite and Sunrise, which can be mechanically harvested. Yields from these varieties, so far, have not been as heavy as those from the tall-growing varieties, but analyses have shown the oil content to be high. The reduced cost of harvesting the dwarf varieties compensates for any reduction in yield.

Soy Bean.—Some fairly large individual areas were sown; results on the whole were sufficiently good to encourage growers to sow again next season. Yields of up to 20 bushels per acre were reported, and considering the season and the lack of experience in mechanically harvesting the crop, were satisfactory. Despite high prices for the beans, it would seem that the bulk of the crop is being retained for seed for the next season's sowing.

Although it has been demonstrated over a number of years that the crop can be grown successfully in many districts, field officers are not recommending production on a large scale until such time as an assured market is available.

Cotton. Weather conditions in the past season were not conducive to successful cotton-growing, and many crops were checked to such an extent that when the abundant February rains occurred they were unable to respond and did not fully recover. The cotton acreage for the 1946-47 season was again small, although the seed applications showed an appreciable increase over the 1945-46 season, being 18,000 acres applied for by 1,085 growers. In many cotton-growing areas sufficient moisture to prepare the seed-beds and to plant cotton was not available until late November and December, which resulted in a reduction of acreage. From past experience, best results are obtained from October plantings.

HORTICULTURE.

Investigational Work.—In the course of the year investigations into problems associated with fruit and vegetable production covered: Refrigerated transport; wastage in pineapples; storage of pineapples for canning and marketing; packing experiments; maturity standards; banana ripening; and oiled fruit wrapping substitutes.

Experiment Stations.—The development of the new fruit and vegetable experiment station near Nambour in the Maroochy district was continued. Investigations included field trials of various leguminous cover crops, soil management, plant breeding, and the harvesting of ginger. Papaw-breeding plots also were established.

At the Kamerunga Experiment Station, near Cairns, North Queensland, appreciable progress was made in soil management investigations. Field work in relation to tropical agriculture was continued.

Land for a new experiment station was purchased in the Redlands district, largely for investigation into the cultural, pest, and disease problems associated with market gardening.

Citrus Fruit Production.—Among important departmental activities is the supplying of pedigreed budwood to nurserymen, among whom nearly 100,000 buds were distributed.

Bananas.—The area under bananas increased slightly to over 13,000 acres. Bunchy top continues as a major problem in the industry and active measures were applied towards its effective eradication.

Deciduous Fruits and Vines.—Further evidence has been forthcoming that, while so-called trace elements are an important influence in the nutrition of deciduous fruit trees in the Stanthorpe district, the basic problem for this area is one of supplying trees with adequate nitrogen at the right time.

An area of suitable land has been acquired in the Granite country for experimental work in viticulture, particularly in respect of the control of phylloxera, phylloxera-resistant stock performance, and of planting distances. Up to the present time the Stanthorpe district has been free from phylloxera and every precaution is being taken to keep it free.

The Stanthorpe district produced a very heavy crop of apples and some 60,000 bushels were exported to Singapore and the Far East.

Quarantine.

New varieties always make an appeal, and with air services now available greater facilities exist for the importation of plant material from overseas. In consequence, there are many progressive orchardists and others seeking permission to import, while others, not realising the risks involved or of the existence of quarantine laws, import material direct. While it is recognised that every opportunity should be taken to improve varieties, it is felt that the harm done by introducing a disease may far outweigh the possible advantages. The position is that quarantine restrictions must be enforced and also that the Department and Plant Introduction Service of the Commonwealth are fully alive to

the advantages and no opportunities are lost to import potentially valuable material and growing it, in the first place, under such conditions as to eliminate risks of disseminating new strains of disease or new diseases.

ANIMAL INDUSTRY.

Pastoral Conditions.

Live Stock Statistics.—The latest available figures show the approximate number of the principal classes of live stock within the State as at 31st March, 1947, to be (figures for the previous year are in parentheses):—Horses, 343,172 (367,357); sheep, 16,084,340 (18,943,762); cattle, 5,945,285 (6,538,067); swine, 340,150 (415,411).

Extension Work and Animal Health.—An extended programme of extension work, including disease and pest control, was carried out during the year.

Sheep and Wool.—Seasonal adversity is reflected in the sheep population which, as estimated, has considerably decreased. Losses in some districts were as high as 25 per cent., while many returns show losses of 10 per cent.

The seasonal conditions also have been reflected in the sheep market. Because of the British agreement, fat lambs have commanded a uniformly high price throughout the year.

The last wool sale in June closed the first year in which wool has been sold by auction since the second world war began. Prices have been at a record high for good quality stylish spinners' wool, free or practically free from vegetable fault, but towards the end of the year a marked price differential was obvious against poor quality faulty wools. American competition has been partly responsible for the stability of the market, and in all 467,772 bales of wool were sold, realising £16½ millions.

The Farmers' Wool Scheme.—The Farmers' Wool Scheme continued to function as usual and 747 bales of wool were handled in the departmental wool room. This shows an increase of 101 bales on last year's total and 267 growers availed themselves of this service. The top price obtained was 46¼d. per lb. for one bale. The market's discrimination against poor quality wool has been reflected in the prices received for the lower lines.

Pigs.

Prices.—The *Pig Meats Acquisition Plan* of the Federal Department of Commerce terminated on 31st December, 1946, so that the price of pigs is no longer controlled. However, the original agreement with Great Britain for pig meats has been varied, whereby quantitative restrictions have been removed and the existing price equivalent to 9d. per lb. for first quality baconer carcases up to 180 dressed weight, at port of export, is to continue to September, 1948. This agreement influences the local price to some extent and tends to give a measure of stability to the industry.

Production.—Production figures for the year reveal a decline as a result of a number of factors, including adverse seasonal conditions, shortage of feeding stuffs, and shortage of building materials.

As a result of these unfavourable conditions, many farmers sold breeding stock for slaughter. With better seasonal conditions and the improved grain position, production is now returning to normal.

Stud Pig Breeding.—The demand for stud pigs was firm throughout the year, not only within this and other States but from New Guinea and other Pacific Islands. Breeders are making every effort to obtain fresh blood lines in order to maintain and improve the quality of their stock. In the selection of breeding stock the services of the Department were made available to buyers and duly appreciated.

Poultry.

Because of a general scarcity of poultry feeding stuffs, egg production declined considerably during the past year. The intake of the South Queensland Egg Board was 8,777,248 dozen, as compared with 11,085,699 dozen in the previous year.

These figures, however, are far short of the State aggregate, as complete production statistics for the Central and Northern Divisions are unavailable.

Slaughter of Poultry.—During the period under review, two large slaughtering works were established. These new establishments are modernly equipped with chilling and cold store rooms. Poultry are slaughtered on these premises for the local and overseas markets. In addition to these establishments, poultry are still being slaughtered on smaller premises which were operating in previous years.

There is evidence of increased slaughterings during the present year, largely because of the shortage of food supplies. Following is a comparison for the years 1945-46 and 1946-47:—

	1945-46	1946-47
July to December	232,765	316,202
January to June	305,773	327,803

Export.—During the year approximately 557 tons of dressed poultry was exported to Great Britain. This is equivalent to about 300,000 fowls.

Table poultry values have been maintained throughout the year at ceiling prices.

DAIRYING.

The 1946-47 season opened unfavourably for the dairy industry. All dairying districts were affected by the dry weather which had continued since the autumn. Fair storm rains occurred in September in parts of the South-east division and were followed by further falls in October, but other districts did not benefit. In districts so favoured, production commenced to rise, but continued dry conditions in other parts of the State necessitated the purchase of relief fodder. Stock losses occurred in some areas.

Good soaking rains fell in November in the Port Curtis district, while scattered storms occurred elsewhere. Although most herds had by this time commenced their new lactation periods, rainfall generally had been insufficient to stimulate production. Summer fodder crops were planted on a smaller acreage than normally, because of the lateness of soaking rains.

Heavy summer rains in January and February assured pasture and crop growth, and consequently a substantial increase in dairy production. Flooding caused crop and stock losses in some areas. Dam and other water supplies were replenished and dairy cattle regained condition. Favourable conditions continued for the rest of the summer but production was much below the peak of other years. Good weather conditions were general in the autumn and to the close of the statistical year. Large acreages of winter fodder crops have been planted, and dairy production should be well maintained in the first quarter of 1947-48.

Dairy Cattle Statistics.

The dairy cattle population of Queensland during recent years is shown in the following table supplied by the Government Statistician:—

—	1943.	1944.	1945.	1946.
Dairy Cows including—				
Heifers over 1 year ..	1,308,780	1,290,398	1,267,829	1,242,071
Calves under 1 year ..	232,276	225,134	210,960	171,318
Bulls 1 year and over ..	32,569	30,522	30,453	29,312
Total dairy stock ..	1,573,625	1,546,054	1,509,242	1,442,701

Imperial Contract and Subsidies.

As from 1st July, 1946, the contract price of butter exported to the United Kingdom was raised to 216s. 10½d. per cwt. The contract between the British and Australian Governments will continue until 30th June, 1948. Negotiations in connection with the renewal of the contract will possibly be opened when the report of the Dairy Industry Costs Committee is received; it is anticipated that the contract will continue until at least 1950.

The present price, including Commonwealth Government subsidy, expected to return to the producer 1s. 7¼d. per lb. commercial butter, was to be reviewed after 31st March, 1947, and the Commonwealth Government has quaranteed the industry that the price for the year ending 31st March, 1948, will not fall below the average price which operated in 1945.

A matter of major interest in relation to the review of prices to be paid producers from April, 1947, was the setting up of a joint dairying industry advisory committee consisting of representatives of the Commonwealth Government and dairy organisations. This committee is charged with investigating the costs of production of dairy produce.

The long-term contract for the sale of the exportable surplus of dairy produce has given a measure of marketing stability never previously experienced by the Australian dairy industry. Land values are buoyant—indicative of the faith of dairy farmers in the future prospects of the industry.

During the war years, and since, all butter distributed in England bore no other description than "National Butter." As from 1st October, 1947, wrappers will be marked with the brand of the country of origin in addition to term "National Butter."

Butter Production and Quality.

Production.—Factory-made butter aggregated 74,068,021 lb., which was estimated to be valued at £6,069,327. This was the lowest butter output in Queensland since the 1927-28 season, and was less than half that of the record season of 1938-39, when 154,377,535 lb. were produced. Although the dry season was the main cause of the decline in butter output, in comparison with that of the preceding season, comparisons of butter production for recent years give a false impression of the decline in dairy production. Over a period of years there has been a pronounced diversion of milk to the market milk trade, cheesemaking, and ice-cream trade, all at the expense of butter.

During the war years emphasis was placed on volume of dairy production rather than on maintenance of quality. While the urgent need for increasing production to meet the needs of food-hungry nations continues, it is equally necessary to produce butter of uniformly high grade. The marked downward trend of butter quality in recent years is deplored. Action to arrest this decline is regarded as urgently necessary. The full co-operation of the advisory services of the Division are obviously available, but success can only be achieved by the united action of all sections of the industry.

New Ways of Making Butter.—Much interest is evinced in new processes for making butter which were developed during the war years in several countries, including the Australian "New Way" process. These methods obviate the use of the churn, the age-old means of changing cream into butter. They are better adapted to the handling of milk and fresh or "sweet" cream, rather than self-ripened, or "sour" cream. Because of sparse settlement, road conditions, and climate, "sour" cream is at present received at all Queensland factories. One of the new machines, developed by Dr. Senn of the Dairy Research Institute in Switzerland, does, however, treat sour cream. In order to determine the suitability under Australian conditions of these machines, which are governed by three underlying principles, the Australian Dairy Produce Board has arranged for the purchase of four machines. These machines will be installed in factories in Victoria, New South Wales, and Queensland, and a technical committee has been appointed to supervise the trials. The "Senn" machine will be placed in the Caboolture butter factory in this State.

Butter Improvement Service.—Field officers of the Division co-operated fully in providing the necessary liaison between the laboratory and the factories in respect of our butter improvement service.

Cheese Production and Quality.

Production.—Queensland cheese production was 17,291,768 lb. in comparison with 26,931,781 lb. in 1945-46. The values were £887,919 and £1,365,919, in the respective years. The decline in production was mainly attributable to the adverse season, but the diversion of large quantities of milk from the Toowoomba and Warwick factories for the Brisbane market milk trade was also a contributory factor.

Milk produced for cheese manufacture returned to the producer an average price of 2s. 3d. per pound butterfat, including Commonwealth Government subsidy. There was a slight change-over from cheese to butter manufacture, but the price margin in favour of the cheese factory supplier has ensured the retention of most cheese factory suppliers.

Grading.—Reciprocity between Commonwealth and State in grading of butter and cheese was continued this year. This has resulted in the official grading of a much higher proportion of cheese than could have been done by State officers alone. The total quantity graded was 9,480,521 lb. The grading results were—

	lb.	Per cent.
Choice and first grade	6,844,074	72.9
Second grade	2,453,233	25.88
Third grade	183,214	1.93

These results are almost similar to those of the preceding season, the corresponding figures for which were 1.26 per cent. choice, 69.01 per cent. first, and 28.28 per cent. second. This is an achievement for which the cheese industry is to be commended, for the protracted dry season caused a serious unbalance of milk constituents, especially protein and mineral salts, which in turn caused much difficulty in maintaining cheese quality. Butterfat content of milk received at some factories in the prolonged dry period fell to the low average of 3.3 per cent., casein 2.2 per cent., and cheese yield 9 lb. per 100 lb. milk; the normal figures average fat 4 per cent., casein 2.7 per cent., and yield 10.7 lb. per 100 lb. milk.

Market Milk.

In recent years, there has been a world-wide increase in the consumption of fresh wholemilk, a trend which also is evident in Queensland. Information from the Government Statistician shows that in 1945-46 over 14,000,000 gallons more milk (approximately equivalent to 2,800 tons of butter) was consumed in this way and as ice cream than in 1940-41. In view of this, it is pleasing to note the lively interest of many Queensland dairy associations in the pasteurised milk trade. A keener public appreciation of nutrition and, in this connection, of the pre-eminent place of a safe, high-quality milk supply is evidently mainly the reason for the greater quantity of milk consumed. This trend is a good thing in the interest of public health, the more effective use of the food constituents of milk, and the potentially more stable and higher-price market for dairy farmers.

The quantity of protein in the separated milk fed to pigs in Australia approximates the whole of the protein produced by the Australian beef, mutton, lamb, and pig-meat industries.

The services of field officers have been freely available to dairy companies which have entered the market milk trade in assisting them to obtain clean, high-quality milk. Our laboratories also have given good service to both producers and factories.

The system of quality control in respect of board-controlled milk is operated by the Division of Dairying. It has materially helped in raising the quality of market milk during the period of seven years since its inception. The scheme provides for effective liaison between the milk treatment plants, producers, laboratory, and field staff.

Board-controlled milk has increased from about 10,000 gallons daily in 1938 to 30,000 gallons daily. The proportion sold as bottled pasteurised milk is estimated to have risen from about 6,000 gallons to 20,000 gallons daily. Every effort is being made to ensure a safe, clean, and wholesome milk supply for consumers.

Other Products.

Butter manufacture stands pre-eminent as the major use to which milk is put in Queensland, with the cheese and market milk sections of the industry of relatively lesser importance. Until recent years, there has been little attempt in Queensland to manufacture other milk products or milk by-products.

Buttermilk.—Several factories have installed roller dryers for the drying of buttermilk, which is used in stock-feeding, particularly by poultry farmers. At two factories, a better quality dry buttermilk is produced. This is sold to the confectionery, ice-cream, fruit drink and biscuit trades. The State's output of dry buttermilk of both qualities in 1945-46 was about 500,000 lb.

Concentrated Milk.—In the course of the year a plant was installed at one factory for concentrating milk.

Margarine.—A world-wide shortage of vegetable fats prevented margarine manufacturers from being able to fulfil the quotas of table margarine allocated them under *The Margarine Act Amendment Act of* 1939.

Dairy Research.—Officers of the dairy research laboratories at Brisbane, Hamilton and Toowoomba investigated many problems of the dairy industry in the course of the year. Research projects included: Manufacture of a non-fat-leaking cheddar cheese; control of mites in cheese factories and cold stores; control of bacteriophage in cheese factories; variations in the composition of milk throughout the year; control of milk quality for the Brisbane Milk Board; improvement in butter composition and quality; and chemical engineering investigations.

Herd Recording and Improvement.—The average production of purebred cows which completed a lactation period of 273 days was 658 gallons of milk and 326 lb. of butterfat. The average butterfat test was 4.84 per cent.

Grade Herd Recording.—For many years the Department has operated a scheme of herd testing, whereby farmers weighed and sampled the milk of the cows in their herds once every two months and forwarded the sample to a factory or the Herd Testing Section in Brisbane. Butterfat tests were made and all records were compiled in Brisbane and sent to the farmer. This scheme is entirely free of cost to the co-operating farmer.

An improved system of herd recording and its early establishment are now under consideration. This new system provides for the formation of herd recording units of about 25 farmers, milking an aggregate of 800 cows; and for the monthly testing of each herd by a recorder who will visit farms, weigh and test the milk and make the necessary calculations. Many dairy farmers have already signified their desire to co-operate with the Department in the establishment of this projected new service.

MARKETING.

A daily market reporting service was instituted in the course of the year. Through this service, farmers and others interested are kept fully informed by Press reports and radio broadcasts on current market conditions, prices and prospects. A monthly production trend and crop reporting service also was inaugurated.

An amendment of *The Primary Producers' Organisation and Marketing Acts* was enacted in the course of the year for the purposes of clarifying the authority of the Northern Pig Marketing Board to control the selling of carcases as well as live pigs within its area; including the word "marketing" in the designation of commodity boards with marketing powers; and giving power to commodity boards to establish superannuation schemes for the benefit of employees and their dependants.

Two new marketing boards were set up—the Navy Bean Marketing Board and the Central Queensland Egg Marketing Board.

Early this year a wheat production costs committee was appointed by the Commonwealth Government. Evidence prepared for submission to this committee in the course of its inquiry outlined the peculiarities of wheat growing in Queensland, with particular reference to production costs in this State.

The year's operations of the commodity boards constituted by statutory authority are reviewed fully in the Report of the Director of the Division of Marketing.

PUBLICATIONS.

An extensive departmental information service was maintained during the year. The chief channels of communication were *The Queensland Agricultural Journal, The Queensland Journal of Agricultural Science, The Cane Growers' Quarterly Bulletin*, bulletins and advisory leaflets, and the public press and radio services.

HYDATIDS IN ANIMALS AND MAN.

Hydatids is primarily a parasitic disease of domestic animals, but man also may be affected. To understand this disease a knowledge of the life history is essential.

The hydatid tapeworm inhabits the small intestine of the dog and of wild carnivorous animals. It is extremely small contrasted with the tapeworms of other species seen in the same host. Ripe segments full of eggs are passed by the host animal and are eaten by the intermediate host, usually a sheep, pig or bovine. The eggs hatch into minute embryos, which burrow through the intestinal wall into the blood stream and are carried to various organs, usually the liver or the lungs. In these sites they give rise to large white-walled cysts which are frequently observed after slaughtering. Only occasionally do these cysts give rise to symptoms. Should humans become infected, however, the condition becomes far more serious.

The life cycle is completed when dogs eat the affected organs of the intermediate hosts. Each cyst may give rise to a large number of tapeworms.

Control measures advocated are:—

(1) Boil all offal, especially from sheep, before it is fed to dogs.

(2) Wash the hands, especially before eating or smoking, after dogs have been handled.

(3) Prevent children from playing on the ground in the vicinity of dog kennels. The soil in these locations may be contaminated with tapeworm eggs.

(4) Dose dogs regularly with arecoline to control tapeworms.

The Beef Industry in the U.S.A.

THOS. G. HOPE.

Mr. Hope, Under Secretary, Premier and Chief Secretary's Department, who is Consumers' Representative on the Queensland Meat Industry Board, was the leader of the Meat Board Delegation to the United States of America in 1945 which investigated latest meat processing practices in that country, as well as the transport of perishable products by rail, road and air.

The subjoined article is based on notes of an address delivered by Mr. Hope at the recent Graziers' Convention at Eidsvold, Queensland. The chief emphasis of his address was on the substantial contribution which the production of beef cattle on small farms on the Darling Downs and in the Burnett District and other suitable agricultural areas might make towards the supply position in Queensland, particularly if these animals were crop-fattened and sold in prime condition at a time when the ordinary seasonal marketings of fat stock have been completed.

Mr. Hope's remarks are particularly pertinent at the present time, in view of the impending visit to Australia next year of the British Food Delegation, which is to investigate, amongst other things, the possibilities of additional beef supplies becoming available for the United Kingdom market.—Editor.

SOME comparisons between the United States of America and Australia show that each country has approximately the same area—3,027,000 square miles in the United States, as against 2,975,000 square miles in Australia. East to west, the United States extends 2,800 miles; in Australia the distance from east to west is 2,500 miles. Respective distances north to south are: United States, 1,600 miles; Australia 2,000 miles (from Cape York to Wilson's Promontory). A thousand miles inland the United States has the Corn-Belt region, as compared with Australia's artesian basin. The United States has 360 million acres under crop, as against 25 million in Australia. In good rainfall zones, the United States have from 500 to 600 million acres of arable land, or about 30 per cent. of that country's total area; while Australia has 85 million acres within the area of comparable conditions, or 4½ per cent. of its total area.

The average production of grain crops in the United States for the five-year period, 1941-45, and in Australia for the period 1941-42 to 1945-46, is tablulated as follows:—

	Wheat.	Oats.	Barley.	Maize.
	Millions of bushels.			
United States	991	1,274	332	3,013
Australia	125.5	19.3	10.0	6.8

Comparative livestock figures are: United States—beef cattle, 82 million; milking cows, 28 million; 50 to 55 million sheep; and pigs, 50 to 55 million. Australia—beef cattle (as at 31st March, 1946) 11 million (of which half are in Queensland); dairy cattle, 3,200,000 (of which one-third are in Queensland; sheep, approximately 123 million; and pigs, less than 2 million.

Meat Production a Major Industry.

Half of the farm lands of the United States and a considerable proportion of its food processors and distributors are wholly or partly engaged in supplying the country's meat. The Department of Agriculture estimated that 28 cents of the farmers' dollar incomes in the year 1944 was derived from meat animals, compared with 14 cents from dairy products and 11 cents from poultry output.

The wholesale meat-packing industry was third in value of the chief manufacturing industries of the United States for the year 1939, being the leading industry in ten States, second largest in six and third, fourth or fifth most important in 11 States of the Union. More than 1,000 meat-packing companies were operating more than 1,500 plants.

Territory west of the Mississippi produces 62 per cent. of the meat supply, while the population east of that great river consumes 66 per cent. of the total meat production.

Transportation is an important factor in American meat industry. It is estimated that on an average the cattleman trucks his animals nearly 700 miles, while the packer ships the carcasses an additional average of 400 to 500 miles.

The Cattle Country.

In Australia, beef cattle are grown and fattened almost exclusively on natural grasses. Breeding and fattening are often carried out on the same properties; single properties often cover many hundreds of square miles; and many of the larger properties are often unfenced or only partially fenced, with watering facilities primitive and inadequate. Happily, such conditions do not prevail in the Burnett and contiguous districts, as the land is too valauble and expenses of production too heavy to permit of haphazard methods.

In the United States, although cattle are produced more or less extensively throughout the entire country, the main beef cattle regions are the Western Range and the Corn Belt. The Western Range includes, broadly, the States of Montana, Wyoming, Colorado, New Mexico and States further west, together with Texas, Oklahoma and the western portions of Kansas, Nebraska and the Dakotas.

The Corn Belt includes, primarily, Iowa, Illinois, Indiana, Missouri, Western Ohio, and the eastern portions of Kansas and Nebraska.

Classified according to the conditions of production, the country may be said to be divided into four regions. The two main regions are, as stated, the Western Range and the Corn Belt, the third being the Great Lakes Region, which includes the Middle and Northern Atlantic States, New England, Michigan, Wisconsin and most of Minnesota; the fourth area is the Cotton Belt, comprising the States producing cotton, and the sub-tropical Gulf country to the south.

The Western Range is in the main semi-arid, and is devoted primarily to breeding and grazing. The Corn Belt States, besides raising animals on a large scale, engage extensively in fattening cattle brought from the Western Range. In the Great Lakes Region "dual-purpose" herds predominate, and the cattle produced are mostly grass-fed.

It will thus be seen that in the United States the breeding and the fattening of beef cattle are practised as two distinct undertakings.

Whereas "corn-fattening" of cattle in America is a highly organized and extensive business, it is not practised at all in this country and even crop-fattening is practised only to a very limited degree.

Cattle Marketing.

As to cattle marketing in the United States, the first thing observed was that it was carried on largely through a system of centralized marketing points, where also are located extensive slaughtering and packing facilities. There are some 67 well-established markets and it was found that up to three-quarters of all the cattle marketed in the United States pass through these central points. In the Corn Belt the proportion is as high as 85 per cent. There are naturally more markets and slaughtering and packing facilities in the Corn Belt than in the other regions, as the cattle population and production of meat is greatly in excess of purely local requirements. The excess production is transported over long distances by motor trucks or refrigerator rail cars to branch houses for distribution to other points of consumption. This is a phase of the meat industry non-existent in Queensland.

Although the United States was at one time a large beef exporting country that position has now changed. About 35 years ago the decline in beef exports became very rapid, so much so that some five years later beef imports exceeded beef exports. During the decade prior to World War I., the status of the United States shifted from that of a beef surplus to that of a beef deficit country.

The great falling away of the exportable surplus was due, not merely to the fact that production did not keep pace with the growth of population, but to its failure to increase at all; in fact, production declined. This decline was so marked that it greatly affected consumption, which likewise declined. This decline in consumption was not only a per capita one, but was actually an absolute one despite the growth of population.

If such a state of affairs developed in this country, it would, without doubt, have the same result, and soaring beef prices would considerably disturb living costs.

It is, therefore, hoped that ways and means will be found to increase our beef-cattle herds, as the population of Australia is bound to increase. Science and energy is all that is required to accomplish this.

Seasonal Supply of Livestock.

Practices which have been developed in the industry in the United States for many years have resulted in the smoothing out of seasonal flows of livstock to the markets from various parts of the country. For example, cattle from the feed-lots are generally marketed in the months January to June. In July and August, cattle which have been grass-fattened begin to come in from the south-west or from the Kansas and Oklahoma pastures, followed by the range cattle of the north-west, which continues until about the end of November. During this time there also come into the market cows which will not prove profitable to carry through the winter, steers which have been fattened on pasture in the Corn Belt and short-fed animals which have merely been freshened

up in the feed-lots by speculators, and the general "clean-up" of herds that will not winter profitably. December is the month for the marketing of show beef. The shows terminate in the National Livestock Exhibition at Chicago.

Small Marketings by Individual Farmers.

A study of "Marketing Livestock in the Corn Belt Region" by the Corn Belt Livestock Marketing Research Committee, published in 1942, emphasises the influence of small marketings by the individual farmers in the over-all production of the American livestock country. This study covered the 12 North Central States—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, North Dakota, and Wisconsin, together with Kentucky and Nebraska. These States supplied 87 per cent. of the pigs, 63 per cent. of the cattle, 52 per cent. of the calves, and 40 per cent. of the sheep and lambs sold from farms in the United States in 1940. Farmers in these States who marketed livestock in 1940 sold on an average 15 cattle, 6 calves, 45 hogs, and 54 sheep and lambs per farm.

The average weight of the fed cattle sold in the region was 937 lb., ranging from 679 lb. in Oklahoma to 1,016 lb. in Illinois, and 1,048 lb. in Iowa. They are generally marketed at heaviest weights in States in which the supply of corn is large and cattle feeding is important.

The average annual maize yield in the United States is well over 3,000 million bushels. Well over ninety per cent. of that yield is retained on the farm for feeding to stock. In addition, there are considerable quantities of other grains, such as grain sorghum and barley, which are also produced on the farm and used almost entirely for stock feeding.

Mr. C. J. McKeon, Queensland Director of Agriculture, who recently visited the United States, has given me an example of the extent to which hand feeding of beef cattle is practised in that country. Mr. McKeon found on a visit to a large property in California that 2,300 head had been fattened on that particular country and sold during the first nine months of last year (1946). Several hundreds more were in the yards in various stages of preparation. Previously the owner had been raising and fattening his own cattle, but latterly had entered into contract with a big rancher to fatten stock under contract. On this property it was the intention to turn out at least 3,000 head for the year 1946. These cattle were all well-bred Herefords and would average 18 to 20 months in age at the time they were brought into the yards. They were intensively hand-fed for a period of about three months before being marketed at 900 lb. to 1,100 lb. live weight. With the exception of concentrates, the whole of the feed requirements was produced on the property on which the cattle were being fattened.

From his observations whilst in the United States, Mr. McKeon found that a large proportion of choice hand-fed cattle marketed in the States comes from small farms on which only a small number are fattened at a time.

Possibilities of Crop-fattening in Queensland.

It would seem, therefore, that substantial benefits to the livestock industry in Queensland might well follow the adaption of the pattern which has been pursued with much success in the United States. Agricultural areas in this State might be suitable, perhaps, to this diversified form of farming, and the examination of the possibilities by those concerned, including producers' organizations, is suggested. It is felt that everything possible should be done to enlarge the period of slaughtering operations in this State by spreading the marketing of prime beasts over a longer period than now prevails. Professor G. W. McCampbell, of the Kansas State College of Agriculture, has stated that more than two-thirds of America's farm and pasture areas produce crops that must seek their final market in the form of meat, dairy, or poultry products, unless fed to other farm livestock.

Certain of our agricultural areas on the Darling Downs and in the Burnett might well be adapted to the practice which has been followed so successfully in the United States and enable livestock to be marketed in prime condition when the usual seasonal flow is diminishing. This envisages the adoption of a policy of utilizing grasslands in rotation with cultivated crops, such as grain sorghums and lucerne. In the Burnett, I am told that the reversion of lands to grass pastures in rotation would be beneficial to the soil itself in restoring organic substances. Such a system of livestock production would ultimately make a substantial contribution towards the increased livestock requirements of this country, while also being of benefit to the producers engaged in the industry.

GRAIN SORGHUM FOR STOCK.

Grain sorghum is a foodstuff of which many stockowners have had little experience. To such stockowners the following information on how to feed grain sorghum to farm animals will be helpful.

The grain is very similar in composition and food value to wheat and maize. It should be coarsely crushed or rolled for feeding to cattle and horses, and comparatively large quantities may be fed to cattle without producing digestive troubles. However, as it is a relatively heavy feed, it is best fed with some bulky feed such as chaff or silage or a bulky concentrate such as crushed oats or bran.

As with the other grains, sorghum has only a comparatively low protein content, and so must be supplemented with protein-rich feed such as lucerne or clover hay, or with protein concentrates such as linseed meal or peanut meal. It may be substituted pound-for-pound for crushed wheat, crushed maize or crushed barley, and about four parts crushed grain sorghum may be regarded as equal to about five parts of crushed oats.

There is no necessity to crush the grain for pigs when it is given through self feeders, but if hand-fed to pigs is should be coarsely crushed or otherwise its digestibility will be considerably impaired. Sheep masticate all whole grain very thoroughly and there is no need to crush the grain for this stock.

Whole grain may be included in the grain ration for poultry, and crushed grain may be used as a considerable proportion of the mash.

Harvesting, Handling, and Packing of Pineapples.

C. G. WILLIAMS, Supervisor, Preparation and Transport, Horticulture Branch.

THE pineapple is very susceptible to bruising; consequently, the harvesting, handling, packing and transport of the fruit must be conducted in a manner designed to prevent such injury.

Bruised areas on the fruit permit the entry of rot-producing organisms which will rapidly render the fruit unfit for consumption. Superficial bruises are not easy to detect when the fruit is being packed and then, often, only by the slight exudation of juice at the location of the injury.

Extra time spent in careful preparatory operations, and the liberal use of wood wool in packing, will pay good dividends, especially on distant markets where wastage is likely to be higher than on local markets.

In order to market fruit in a sound and attractive condition, the following procedure is suggested in regard to the selection of the fruit and handling and packing methods.

A. Type of Fruit.

None of the following types of fruit should be included:—

(*a*) Fruit visibly affected with sunburn, frost injury, yeasty rot, black speck or bruises.

(*b*) Fruit showing any leakage of juice at packing (except at cut stalk) whether from bruises, growth cracks or other causes.

(*c*) Fruit with more than two tops.

(*d*) Fruit with knobs or slips on base of fruit.

(*e*) Fruit with aborted, dwarfed or deformed tops.

(*f*) Malformed or crippled fruit.

(*g*) Fruit whose stalks have been wholly or partly broken before maturity. (Such fruit is invariably of poor quality and subject to black heart.)

B. Maturity.

(*a*) All fruit should conform to current Departmental standards of maturity and all fruit in the one case should be uniform in colour.

(*b*) Fruit packed for distant markets, such as Adelaide, New Zealand, &c., must not show more or less than a tinge of yellow colour.

C. Handling.

(*a*) Fruit should be cut from the plant and not snapped. If necessary, the stalk should be trimmed back by a second cut to project ¼-inch beyond any part of the base of the fruit.

(*b*) Fruit should be carried out of the plantation to the end of the rows in the arms or in baskets, *not in bags*. Baskets should be free of internal projections and may be padded with wood wool.

(*c*) Whatever type of container or transport vehicle may be used for the conveyance of the fruit from the plantation to the packing shed, the fruit should not be placed in a high stack, as this is conducive to bruising.

(*d*) Wood wool padding should be used between the fruits as much as possible during all handling operations.

D. Packing Shed.

(*a*) Any discarded fruit, tops, leaves or other refuse accumulating during packing should be removed *completely* within twenty-four hours. Such refuse should preferably be buried, or, failing this, removed at least two hundred yards from the packing shed and there spread out rather than heaped up.

(*b*) The packing shed, floor and packing bench, together with picking baskets, field crates (where re-used) and transport vehicles, should be disinfected once a week by spraying with 2½ per cent. formalin (2 fluid oz. per gallon). This can be done with a knapsack spray or stirrup pump.

(*c*) Packing sheds should preferably have wood or concrete floors, *not dirt floors*. The best type is a hardwood floor raised to truck height. (Recommendations and designs for packing sheds can be obtained from this Department.)

Both shed and equipment should be designed to allow easy cleaning of the entire shed.

E. Packing.

(*a*) All fruit should be packed in clean cases. The tropical case, 24½ inches long, 12 inches deep, by 12 inches wide, is used for packing pineapples.

(*b*) Cases should be made up with end cleats parallel to the sides of the case, so as to assist carriers to stack them in their correct position—on their sides. Cases should be as strongly made as possible, preferably with 1¾-inch nails

(c) Fruit in the one case should be uniform in size. Over-size tops may be trimmed back, but not to less than two inches from the solid core of the top.

(d) Fruit should be firmly packed with not less than 60 lb. of fruit in the case. Wood wool should be used at each contact of fruit with fruit or fruit with case.

(e) Packed cases, after the lid has been nailed down, should have a bulge of half-an-inch at the top centre and bottom centre of the case.

(f) The case should be clearly branded on *both* ends with—

(1) Grower's name and address.

(2) The name of the fruit.

(3) Count and variety (*smooth* or *rough leaf*).

(4) Consignee's brand.

Packing Procedure.

Before proceeding with packing, the pineapples should be graded for colour and size.

Colour should vary from a tinge of yellow for distant export markets to three-quarters yellow colour for the local trade and it is desirable that the cases should contain fruit of uniform colour. On no account should green immature fruit be packed. Pineapples will not develop sugar after picking; therefore, fruit picked before it has developed any yellow colour will not improve much in flavour and will remain acidic and unpalatable, even though it will eventually turn yellow in colour.

Grading of the pineapples may be done either in the field from the harvesting baskets into lug boxes or other suitable containers placed at the end of the plantation rows, from the transport vehicle at the packing shed direct to packing benches, or from the transport vehicle at the packing shed into boxes. The placing of ungraded or graded fruit into large heaps is not recommended, as this is conducive to bruising.

A suitable grading board may be made by cutting holes of the required diameter out of three-ply or pine board.

Packing. The packing of pineapples is, comparatively speaking, a simple matter. Varying shapes will occur in any particular variety, but, provided proper grading methods are used, no difficulty should be experienced in packing fruit of irregular shape.

By reference to the illustrations (Plates 1—9) the method of placing and packing the various sizes can be easily understood.

Large pineapples do not carry well. Therefore, fruit larger than 11 count (5 inches diameter) should be forwarded to the factory.

Pineapples smaller than 27 count (3½ inches diameter) should be disposed of at local markets.

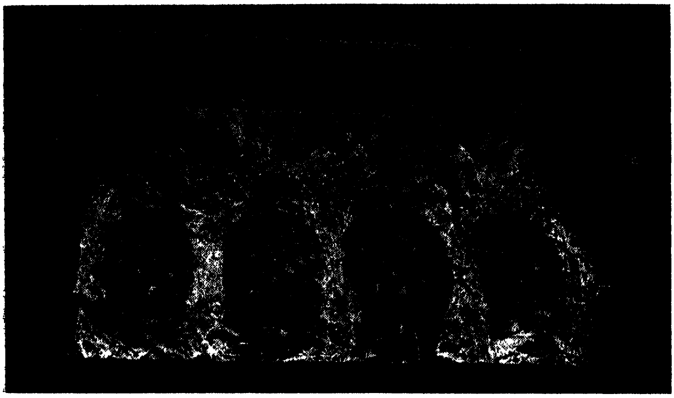


Plate 132.
11 PACK—BOTTOM LAYER.

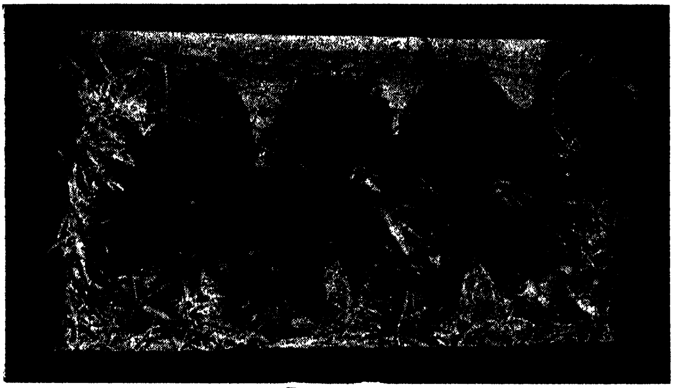


Plate 133.
11 PACK—FIRST AND SECOND LAYERS, 4 x 3.

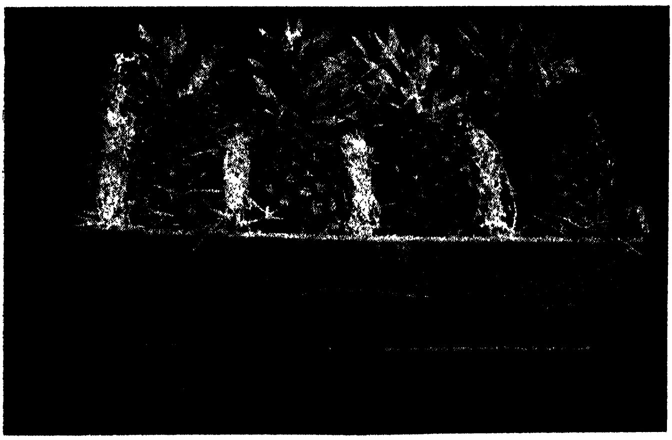


Plate 134.
11 PACK—TOP VIEW OF FINISHED CASE. THREE ROWS, 4 x 3 x 4.

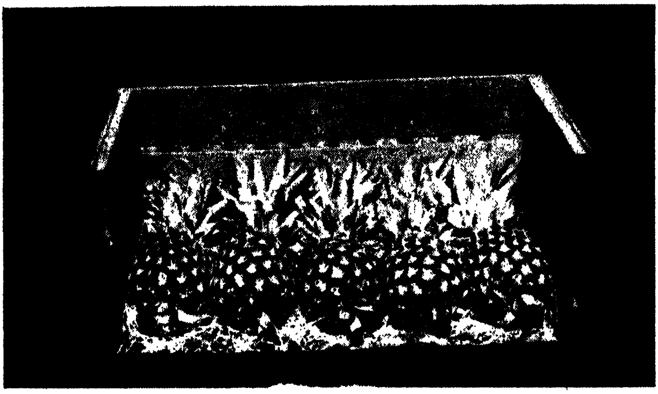


Plate 135.
14 PACK—BOTTOM LAYER.

Plate 136.
14 PACK, SHOWING POSITION OF LAYERS. THREE LAYERS, 5 x 4 x 5.

Plate 137.
14 PACK—TOP VIEW OF FINISHED CASE.

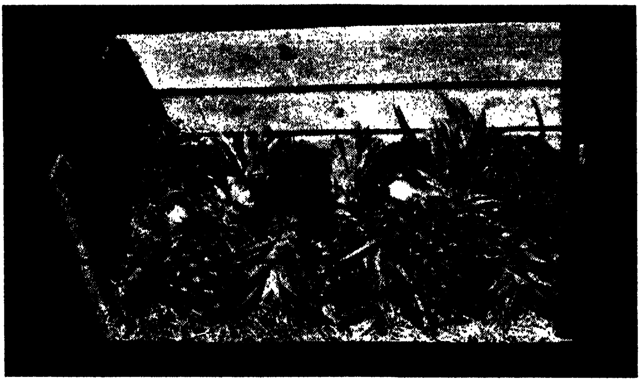


Plate 138.
21 PACK—BOTTOM LAYER.

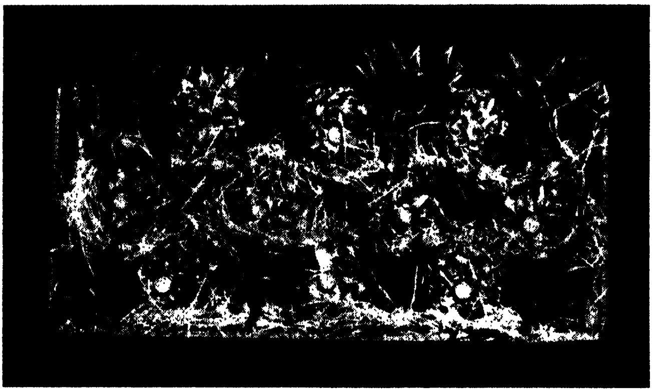


Plate 139.
21 PACK, SHOWING POSITION OF LAYERS. THREE ROWS, 7 x 7 x 7.

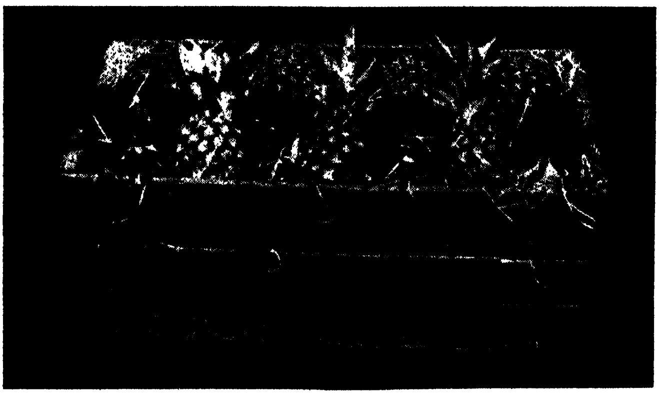


Plate 140.
21 PACK—TOP VIEW OF FINISHED CASE.

For general purposes, the following table of packing counts will be found satisfactory:

PINEAPPLES PACKED IN THE TROPICAL FRUIT CASE.

$24\frac{3}{8}$ inches long, 12 inches deep, 12 inches wide.

Plate No.	No. of Fruit in Case.	Diameter of Fruit at its Centre.	No. of Layers in Case.	No. of Fruit in Each Layer.	Method of Placing the Layers.
1, 2, 3 ..	11	5 inches	3	$4\times3\times4$	Single row in line; each row placed alternately with the stalk ends of the fruit touching opposite side of the case.
	12	$4\frac{3}{4}$ inches	3	$4\times4\times4$	Ditto
4, 5, 6 ..	14	$4\frac{1}{2}$ inches	3	$5\times4\times5$	Ditto
	15	$4\frac{1}{4}$ inches	3	$5\times5\times5$	Ditto, OR, with the end pineapple in each row reversed so that its stalk end touches the opposite side of the case.
	18	4 inches	3	$6\times6\times6$	Two rows are placed so that each fruit has its stalk end alternately at opposite sides of the case.
7, 8, 9 ..	21	$3\frac{3}{4}$ inches	3	$7\times7\times7$	Ditto
	24	$3\frac{1}{2}$ inches	3	$8\times8\times8$	Ditto
	27	$3\frac{1}{4}$ inches	3	$9\times9\times9$	Ditto

Factory Pineapples.

The Committee of Direction of Fruit Marketing, Brisbane, has supplied the following information with regard to factory pineapples:—

"Cannery pineapples will be received by the C.O.D. for distribution to factories subject to the following conditions:—

1. At loading centres where C.O.D. loaders are employed, pineapples will be accepted only through the C.O.D. loader.
2. All fruit to be freshly picked and to be loaded in a sound condition.
3. Smooth Leaf variety only to be forwarded.
4. *Colour Standard.*—Fruit shall be picked when showing the following colour:—

   Grade 1—Half-coloured.

   Grade 2—Quarter-coloured.

   'Smalls'—Half-coloured.

   The colour standard may be varied from time to time by notification through the 'Fruitgrowers' Gazette,' except that at all times 'Smalls' must be at least half-coloured.

TWO METHODS FOR PACKING FACTORY PINEAPPLES. NOTE THAT TOPS ARE REMOVED (CUT) AND WOODWOOL PADDING IS NOT REQUIRED IN FACTORY PACKS.

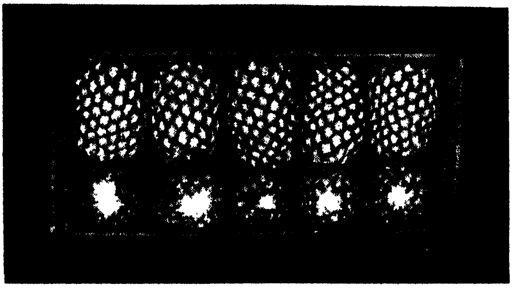


Plate 141.

1 ROW VERTICAL, 2 ROWS FLAT. TOTAL, 15 PINEAPPLES.

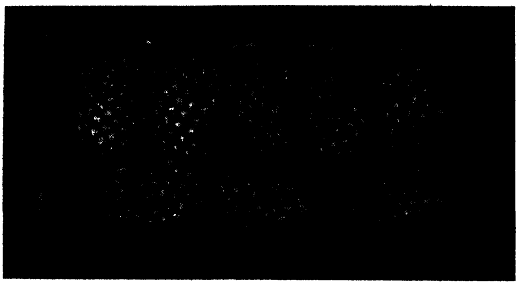


Plate 142.

2 LAYERS FLAT—16 PINEAPPLES.

The average net weight for factory fruit should be 64 lb. per case.

"With the object of easing factory deliveries as much as possible during the peak weeks, the factories have agreed to a relaxing of the external colour standard. It is suggested to growers that pineapples should be forwarded during the weeks just prior to the peak of the crop if they consider that the internal colour indicates that the pineapple is suitable for canning.

"Many growers know from experience that pineapples under certain conditions, although only showing the first tinge of colour at the base, have the internal yellow colour required for canning.

"Growers are asked to exercise care in excluding fruit which will be too green for canning and which would have to be rejected at the cannery.

"It should be clearly understood that growers must accept full responsibility for the fruit being ripe enough for canning. When supplies become heavy, the external colour standard as shown above must be strictly observed.

"By the adoption of the above suggestion, it should be possible for factories to handle thousands of cases more before the peak of the season than would otherwise be the case if general observance of the colour standard were adhered to throughout the season.

5. Pineapples are to be graded to three sizes as follows:—

(a) 4 inches in diameter and under 5 inches to be known as Grade (1).

(b) 5 inches and over in diameter to be known as Grade (2).

(c) All pineapples not large enough for grade 'ones' to be known as 'Smalls.'

"During the peak weeks it may be necessary to restrict the intake of 'Smalls' and the following specifications will apply:—

'Small' must be not less than 3½ inches diameter and 4 inches in length.

Length.—The full length of fruit in Grades (1) and (2) must be not less than 5 inches, measurement to be vertical, not on curve of fruit.

Minimum Size—Grade (1).—The minimum size pineapple acceptable as Grade (1) must have a full length of 5 inches and have a vertical measurement of not less than 4 inches from where a 4-inch grading ring rests on the shoulders to the base of the pineapple.

6. Grade (2) must be marked plainly in chalk with the numeral '2' on both ends of the cases. It is not necessary to mark Grade (1).

7. 'Smalls' must be marked with a large letter 'S' in white chalk on both ends of cases.

8. Abnormally shaped fruit and large fruit affected with sunburn will be accepted as 'Smalls' for juice purposes. 'Smalls' affected with sunburn are not acceptable.

9. Pineapples should be forwarded *without tops* in all loadings and packed according to Plates 10 and 11. Tops must on no account be screwed off. Projecting stems and fringe leaves at base and top of pineapple must be trimmed off flush with fruit.

10. *Cases—Tare.*—All cases must be weighed and the tare to the nearest pound plainly stencilled on the top board on each side of the case. Number stencils for this purpose will be supplied, free of charge, to those growers who have not already received one, on application to the loader, or where no loader is employed, to the C.O.D.

11. *Branding.*—All cases to be branded distinctly, on each side of the case underneath the tare, with the name of the grower and the railway station from which the fruit is consigned.

12. *Packing.*—Cannery pineapples are carried by the railway on a case rate basis and it is, therefore, necessary that cases be packed to capacity. Care must be exercised, however, to ensure that no fruit projects above the top of the case.

"Growers consistently loading lightweight cases will be debited with the excess freight involved. Cases containing less than a net weight of 60 pounds will be considered lightweight cases.

"Cases containing 'topped' fruit must be loaded without being lidded and with the mouth of the case upwards.

13. These conditions may be varied from time to time."

The Growing of Green Manure Crops in the Orchards of the Stanthorpe District.

A. A. ROSS, Horticulturist.

THE granitic soils of the Stanthorpe district, even when newly cleared, have a low organic matter content, and in order to ensure reasonable cropping capacity in orchard trees it has been found necessary to supply this material regularly to the soil. Since bulky waste organic materials, such as farmyard manure and straw, are not available in large quantities in the district the only practicable method of maintaining a plentiful supply of organic matter is, whenever possible, to grow green manure crops and turn them in.

CROPS TO GROW FOR GREEN MANURE.

It has been found that the majority of the soils in the Stanthorpe district are deficient in nitrogen as well as in organic matter. Thus it is obvious that a leguminous crop should be grown wherever possible, because legumes have the power of utilizing the nitrogen of the air for their own nutritional needs and this, after the green crop has been turned in and has rotted down, becomes available for the use of succeeding crops. Since practically none of the orchards are irrigated, a summer-growing green manure crop cannot be grown successfully between the trees. Such a crop would remove so much water from the soil as to produce a serious moisture deficiency in the root zone of the trees. This means that a winter-growing species must be selected, because during the winter months the trees are bare of leaves and their water requirements are then very low. The climate of the Stanthorpe district places a further severe restriction on the choice of a crop, since the extreme winter temperatures experienced prohibit the growing of many species found suitable for green-manuring purposes in other parts of Queensland.

A number of winter-growing crops have been tested experimentally under Stanthorpe conditions. Of the legume group, New Zealand blue lupins have proved to be the most satisfactory. Among the non-legumes, the cereal group contains several successful winter-growing species and of these Black Winter rye has proved the most reliable. Wheat, oats and barley also produce satisfactory crops when seasonal conditions are favourable. The following notes briefly describe the behaviour of a number of green crop species under Stanthorpe conditions.

New Zealand Blue Lupins.

Lupins have consistently produced a greater bulk of green material than other legumes grown in the Stanthorpe district. After they become reasonably well established they resist drought and frost to a remarkable degree, though they do not make very much headway during the winter months. In orchards, the greater part of their growth should be produced in the autumn; hence time of planting becomes an all-important factor.

Golden Tares.

Stanthorpe climate and soils are suitable for the growth of this crop. However, it does not produce as large a quantity of green

material as lupins; it is more susceptible to frost and is slower growing. Since they have a scrambling habit of growth, tares do well in combination with an upright-growing crop such as a cereal.

Field Peas.

Field peas give a poor yield of green material in comparison with lupins. In addition, because they are very soft and succulent, their contribution of humus-building material is small. They resist moderate frosts but may be damaged or even killed by severe ones. As green manure crops there is little to choose between the available varieties of field peas.

Tick Beans.

Tick or horse beans have not met with much success when grown over a number of seasons. They produce little winter growth and do not thrive under dry conditions. In addition, they are very susceptible to a bacterial disease which gives a very serious setback to the crop.

Vetches.

Only a comparatively light yield of vetches can be expected even in a mild moist winter. They are very susceptible to drought and therefore cannot be relied upon to produce a satisfactory crop every season.

Clovers.

All small-seeded species experience great difficulty in germinating in Stanthorpe soils. Unless soil moisture conditions are just right, small seed such as clover seed fails to germinate freely. If seed is sown shallow, it will frequently lie in a layer of soil which is too dry; if sown at a depth where the soil is moist a large proportion will rot. Clovers, moreover, usually give only a comparatively light yield and do not justify the extra attention necessary to ensure their successful establishment.

Black Winter Rye.

This is by far the most successful of the cereal crops. It has the greatest cropping capacity of them all, is highly resistant to drought and frost and produces a reasonable crop even on poor sandy soils. However, it is relatively slow in decomposing on being turned in and may interfere with the process of nitrification in the soil for an unduly long time, especially when the spring months are dry.

Wheat.

In some seasons, good crops of wheat can be produced but care should be taken to sow a reliable variety of hay wheat. Wheat which is sold as stock feed cannot be considered suitable for seed for a green manure crop; further, many of the varieties grown for grain are unsuitable. Currawa, Ford and Florence are varieties which may be expected to produce reasonable crops. Wheat makes most of its growth in spring, and unless there is sufficient rain at that time the crop will suffer. In many cases, too, it will need to be turned in before it has had an opportunity to produce a satisfactory bulk of material, in order to avoid competition with the trees for the available moisture.

Barley.

Barley is not favoured as a green manure crop in the Stanthorpe district as it is usually not as vigorous as the other cereals. It suffers severely from rust and is susceptible to injury by frost. However, in certain mild winters quite satisfactory crops of Cape or Skinless barley can be produced.

Oats.

Although oats are usually more vigorous than barley, this crop does not tolerate excessively low temperatures. The average winter of Stanthorpe proves too severe for the successful raising of oats and therefore they are not recommended as a green manure.

Plate 143.

COMPARISON OF NEW ZEALAND BLUE LUPINS AND WHEAT PLANTED AT THE SAME TIME AND GROWN UNDER IDENTICAL CONDITIONS.

PLANTING THE CROP.

Time of Planting.

The time of planting is possibly the most important factor in the production of a green manure crop in the Stanthorpe district. Since irrigation is not practised at all in the orchards the best use must be made of the rain which falls. The average trend of rainfall is light falls in January followed by fairly regular rain in February and March. After the end of March falls become lighter and winter rain is normally comparatively sparse. In order to secure a good germination followed by vigorous growth the following procedure is recommended. The fertilizer should be applied and the soil suitably prepared to receive the seed by the middle of January. Seed should then be sown following the first effective fall of rain. A prompt and efficient germination will result and the normal February rains will ensure desirable conditions for subsequent growth. When this course is adopted, plants become firmly established and sufficiently vigorous by the onset of winter to withstand the cold conditions and a certain degree of drought.

Plate 144.

A CROP OF NEW ZEALAND BLUE LUPINS PLANTED IN JANUARY, 1947.

Plate 145.

A CROP OF NEW ZEALAND BLUE LUPINS PLANTED IN APRIL, 1947. (Compare with Plate 144.)

Fertilizing.

Fertilizer is best applied at the time of preparing the soil for planting and may be broadcast on top of the weeds and other rubbish just before ploughing or discing. Mixing of fertilizer with the seed has an adverse effect on germination and will kill many of the nitrogen-fixing bacteria on inoculated legume seed. Experiments conducted on the fertilizer requirements of green manure crops in the district have shown that leguminous crops do best when grown on a mixture with moderate nitrogen, high phosphate, and low potash contents. A mixture with a formula of approximately 4:15:2 would be satisfactory. The quantity to be applied per acre will vary with the fertility of the soil at the time of planting, but on an average 2½ cwt. per acre of such a mixture will suffice. Cereal crops have been found to respond only to nitrogen and therefore phosphate and potash can be safely eliminated from the fertilizers used for growing them. A satisfactory dressing for these crops is sulphate of ammonia at the rate of 1½ cwt. per acre or nitrate of soda at the rate of 1¾ cwt. per acre.

Seed Inoculation.

In soils which have never grown a particular leguminous crop successfully it is a wise precaution to inoculate the seed to ensure that the correct strain of nitrogen-fixing bacteria is present. This can be done by coating the seed with a suspension of the specific bacteria. The correct culture can be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane. It is supplied, with full directions for use, in bottles sufficient to treat either one or three bushels of seed, at the nominal charge of 1s. per bottle. Fourteen days' notice is required when ordering cultures, which may be expected to keep for six weeks if unopened.

Rates of Sowing.

The following rates of sowing have been found satisfactory for most purposes.

Crop.	Rate per Acre.	Crop.	Rate per Acre.
N.Z. Blue Lupins ..	1 bushel	Black Winter Rye ..	1 bushel
Golden Tares	¾ bushel	Wheat	1 bushel
Field Peas	1 bushel	Barley	1 bushel
Tick Beans	1 bushel	Oats	1 bushel
Vetches	20 lb.		

The rate for lupins may be reduced to ¾ bushel after one reasonable crop has been produced on a particular area of land.

Method of Sowing.

A seed drill is the ideal implement for sowing but few orchardists are likely to possess this machine. Broadcasting has to be resorted to in most cases, followed by an implement which will cover the seed. In covering, the object is to place the seed in a layer of soil moist enough to induce germination without burying it too deeply. The larger seeds such as those of lupins should be covered to a depth of about 2 inches and smaller seeds slightly shallower. Tandem disc harrows and rotary hoes are very suitable implements and others such as tine

cultivators and diamond harrows will do the job, though less effectively. When inoculated seed is sown, covering should very closely follow broadcasting, as the drying action of the sun is detrimental to the bacteria on the seed coat. The best results from the use of inoculated seed can be expected only if seed-bed moisture is good, since dry soil, too, can have a very adverse effect on the bacteria.

TURNING IN THE CROP.

Turning in the crop is an operation which should receive as much attention as any other part of the practice of green manuring. The time and the method are two aspects which must be given strict consideration if the maximum benefit is to be derived from the crop.

Time to Turn In.

In the early spring, orchard trees require a free supply of moisture and nutrients to develop a strong blossoming and to ensure a good setting of fruit. Consequently, it can only be considered bad management to have a green manure crop standing so late as to compete with the trees for moisture at this stage. A further consideration is that decomposition of the green manure crop, after it is turned in, will proceed relatively slowly unless a plentiful supply of soil moisture is present. This decomposition of organic matter in the soil has the effect of producing a temporary shortage of available nitrates, the period of shortage being less in the case of leguminous crops than with other species, because of the greater quantity of nitrogen contained in plants belonging to this group. The shortage must be overtaken by the time the trees begin to bloom. Hence, as spring weather is usually dry, late turning-in must be avoided. On the oher hand, the maximum growth should always be received from each crop, so turning-in should not be done any earlier than necessary. As a general rule, cereal crops are ready by about the first week in August and leguminous crops by the third week. In seasons when good spring rains occur, crops may be allowed to grow a little later, but a close watch should then be kept on the soil moisture.

Method of Turning-in.

In the past, it has been the custom to plough in green manure crops so as to cover, as far as possible, the whole of the plant material. Such a method places bare soil on the surface. The more recent tendency is to develop a mulch of organic matter on the surface of the soil and this can be achieved only by shallow working. Implements such as tandem disc harrows and rotary hoes can be used to produce this effect, but they must not be allowed to penetrate too deeply. Just sufficient soil should be taken to incorporate the crop material in the surface layer and this is usually found to be about two inches. Operators of such machines must understand that the ideal finished surface is not one which is perfectly clean with no plant material showing, but one which is rough and has a large amount of mulch on the surface.

SUMMARY.

New Zealand blue lupin (legume) and Black Winter rye (cereal) are the most successful green manure crops to grow in the orchards of the Stanthorpe district.

The crops should be planted in January or early February.

Recommended fertilizer dressings are:—For legumes, 2½ cwt. per acre of 4:15:2 mixture; and for cereals, 1½ cwt. of sulphate of ammonia or its nitrogen equivalent in some other form. The fertilizer is best applied to the land before it is prepared for planting.

In soils which have not previously grown successfully a particular leguminous crop, the seed should be inoculated with the correct strain of nitrogen-fixing bacteria.

Early August for cereals and late August for legumes are usually found to be the correct times for turning in green manure crops.

The crop should not be completely buried but merely mixed in with the top 2-3 inches of the soil by shallow cultivation with such implements as tandem disc harrows and rotary hoes.

ORCHARD WINDBREAKS.

The advantage derived from shelter belts (windbreaks) where orchards are exposed to strong winds are not always fully realised. Not only is the loss from windfalls very great in orchards exposed to strong winds, but the growth and general health of the trees is adversely affected. It is not uncommon under such conditions to find the bulk of the crop of fruit carried on the sheltered side of the trees, on which side the wood growth also is stronger.

What variety of tree to plant as a windbreak requires careful consideration, as the trees chosen must fulfil certain requirements. They must make fairly rapid growth and reach a height and produce foliage of sufficient density to serve the desired purpose. The object of a windbreak is not absolutely to block the wind, as if this were done the wind passing over the top of the break would tend to at once drop or dip and strike the trees two or three rows back in the orchard. What is required is a break that will sufficiently slow down the speed of the wind that passes through it as to render it harmless. Another important requirement is that the trees of which it is formed shall not be subject to attack by scale or other pests to which fruit trees are subject. The cost of the young trees also should not be too high.

The windbreak should not be planted too close to the orchard; a distance of 30 feet or more is advisable. If sufficient land is available, a double row of trees, those in the second row being planted opposite the centres of the spaces in the first, is to be preferred to a single one. Where a double row is planted, the distance between the trees in the row can be increased. Rows 10 to 15 feet apart, with the trees 20 feet apart, will usually be found satisfactory. By keeping an open drain 5 or 6 feet from the windbreak its roots are prevented from robbing the orchard trees of plant-food and moisture.

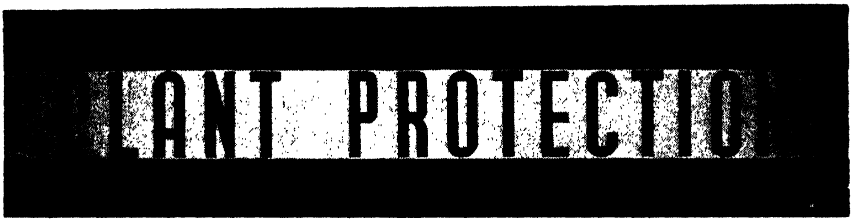
It is sometimes found that, because of the planting of an unsuitable variety or as the result of planting the break too close to the orchard, windbreaks rob the fruit trees of much needed moisture. In such cases the windbreak roots extending into the orchard should be periodically cut and the top growth carefully lopped.

CO-OPERATION.

George H. Maughan, patron of the G.L.F., Ithaca, New York, said at a discussion at the American Institute of Co-operation at Purdue University:—

"Farmers need much more help than they are getting in developing a co-operative philosophy. We are not thinking of the academic methods and facts so often stressed by professional teachers. We have in mind the matter of participation—thinking, speaking, acting in local groups without stress on how this is done.

"Managers, all responsible employees of co-operatives, are the natural teachers and leaders in this work. They should assume the duties of educating and actuating their employers—the patrons. This takes wise, unselfish, statesmanlike leadership."



Army Worm and Other Noctuid Outbreaks During 1946-47.

J. HAROLD SMITH, Senior Entomologist, and N. E. H. CALDWELL, Assistant Director of Horticulture.*

FROM time to time, some insects which are normally of only minor importance appear in countless numbers and cause considerable damage to crops. From this point of view, the summer of 1946-47 was remarkable in that three such species, two of them army worms, and the third, a cutworm, attracted attention during this period.

Insects Involved.

Three main species of the family *Noctuidae* were involved. This family of moths contains many important pests with a worldwide distribution. A few of them, such as the fruit-sucking moth†, which has the mouth parts strengthened to enable it to pierce fruit, are pests in the adult or moth stage but most are injurious in the larval stages which attack either the leaves or the stems of crop plants. The species under discussion are all of the latter type and the larvae of each have the characteristic habit of curling up, clock-spring fashion, when handled.

The common army worm‡ is the larva of a dull-brown or fawn-coloured moth with a wing span of about 1½ inches. It has a single black spot on the centre of each forewing. Eggs are laid on vegetation near the ground in compact groups. From these emerge small caterpillars which, after feeding for a week or so, become typical army worms with few distinctive features other than their gregarious habits. When full grown, they are about one and a half inches in length and dirty-grey to greenish-grey in colour, with several dark longitudinal stripes. At times, they are present in such large numbers that crops are attacked on a face by dense, moving swarms covering half an acre or more. Outbreaks usually occur in fodder crops though the pest has a very wide range of host plants. Outbreaks of this pest are most common on the Darling Downs.

The variegated army worm§ behaves in somewhat the same way as the common army worm and has rather similar habits. However, the parent moth differs in its colouration, for the forewings have a

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† *Ophideres fullonica* L.

‡ *Sideridis unipuncta* Haw.

§ *Spodoptera exempta* Walk.

variegated pattern made of black, brown and grey markings. The caterpillars, too, are somewhat more distinctively marked, for light and dark coloured stripes run parallel along the whole length of the body. Though outbreaks occur in fodder crops, the pest attracts most attention in pastures. This may, however, simply be due to the fact that in the coastal areas, where outbreaks are most common, a relatively small proportion of the average farm is planted to fodder crops.

The greasy cutworm* is a cosmopolitan insect not normally regarded as a serious pest in Queensland. The parent moth has almost black forewings without any distinctive markings. Like the better known brown cutworm, eggs are laid on and among low-growing weeds in cultivated ground and the larvae emerging from them attack young plants both at ground level and sometimes above ground. The pest is usually noted in areas where market garden crops are grown extensively.

Conditions Favouring Noctuid Outbreaks.

The numbers of any pest vary a great deal from season to season and from year to year. The reproductive capacity of most insects is such that almost any species could become overwhelmingly abundant were it not for the interaction of such factors as competition for food, attacks by parasites and predators, and climatic checks which may either injure the insect directly or tip the scales in favour of its enemies. Climatic checks are particularly important, for it is well recognized in entomological practice that unusual weather, e.g., prolonged drought or unseasonable rains, may produce outbreaks of some pests which are generally considered of minor importance. Rainfall during 1945-46 was below normal throughout Queensland and the winter of 1946 was particularly dry in southern and central portions of the State. However, good spring rains fell in September. Therefore, outbreaks of several comparatively minor pest species were not entirely unexpected.

Most Noctuids spend the winter as pupae in the soil, where they are subjected to a number of risks. Temperature changes in a dry soil have little effect on their survival but winter rains are usually followed by a heavy pupal mortality below ground. The dry winter in 1946 was, therefore, an indication of possible spring outbreaks of some Noctuids. The spring rains of 1946 were very favourable for a moth emergence and larvae developing from the eggs laid by them found host plants in abundance on which to feed. Consequently they developed with little or no check. Later, in summer and autumn, outbreaks of serious proportions of the army worm, the variegated army worm and the greasy cutworm occurred as succeeding generations emerged.

The Common Army Worm Outbreak.

Though noted in several crops during October, the common army worm caused little damage and showed no signs of the gregarious habit exhibited in very bad outbreaks. In February, the first inkling of a serious outbreak came in a report from Warwick that larval swarms were present in some fodder crops there. In rapid succession, further reports of swarms were received from other parts of the Darling Downs. These indicated that the pest was most active in the area with Toowoomba, Clifton, Pittsworth and Bowenville as the main centres.

* *Agrotis ypsilon* Rott.

The picture presented by these reports may have been over-simplified, for the area concerned is intensively farmed and the importance of the pest would be proportionately greater than in districts further afield where properties are larger and cropping practices rather different. Outbreaks were reported as far afield as Millmerran and Jandowae but the data were insufficient to give a true picture of the position in these and intervening districts.

In the more intensively farmed areas, summer fodder and grain crops had been planted extensively and many had already reached or were approaching the heading stage during the February–April period when the pest was particularly active. These summer crops included Sudan grass, panicum, dwarf Setaria, white French millet and maize, all of which were attacked. One summer cereal, grain sorghum, was apparently not liked by the pest, for this crop remained more or less free from infestation even though it is grown extensively on the Darling Downs. On maize, the attack coincided with that of a better-known insect, the corn-ear worm*, and the two pests, working together, seriously injured both the flag and the flowering parts of the plant.

The common army worm feeds principally at night. During the day, it takes cover under debris on the ground and may even burrow into the surface mulch. Apparently, shelter during the day is more important than location, for on maize a large proportion of the caterpillars remained on the plant in the funnel leaves where they were partially shut off from direct sunlight. Occasionally, dense swarms showed some activity during the day, particularly in dull weather, but this habit was unusual. Normally, feeding began at dusk and continued during the night until the insects returned to ground level at daybreak. Though the leaves of the crop were sometimes stripped from the stem, the army worms showed a distinct preference for the younger and more succulent growth at and near the growing tip, particularly when the crop was coming into head. Thus, while the pest caused severe injury to fodder crops which were to be fed to stock or cut for hay, attacks were most serious in crops grown for grain.

One unusual feature of the outbreak was the even distribution of the insects within the infested crop. Dense swarms covering an acre or so were noted on several occasions, but, more commonly, three or four army worms would be feeding on every plant in crops covering fifty acres or more. Such behaviour on the part of the insect has been observed previously in maize but not in a district-wide outbreak such as that under discussion. Control measures in cases of this kind involved treatment of the whole crop rather than the destruction of a compact swarm of limited dimensions.

The common army worm is preyed upon by a wide range of parasites and predators and at least three which attack the larval or caterpillar stage of the pest came to farmers' notice during the outbreak. Ichneumonid wasps were prominent most of the time. These are fast-flying, rather slender-bodied and long-legged insects, half an inch to an inch in length, which, by means of a long ovipositor, lay their eggs within the bodies of well-grown caterpillars. The latter pupate normally but thereafter the parasitic larvae develop at the expense of the host which is finally destroyed. In due course, wasps of the next generation emerge from the army worm pupae.

* *Heliothis armigera* Fabr.

Another family of parasitic wasps, the Braconids, was represented by a small, black species* not more than one-eighth of an inch long. This parasite attacks the caterpillar in the same way as the Ichneumonids but in this case the host succumbs before reaching the pupal stage. At the approach of death, the larva usually crawls to some exposed situation. The parasite larvae—there may be a large number in one caterpillar—then emerge and immediately spin whitish silken cocoons about one-eighth of an inch in length. All the cocoons on one host are loosely bound together and it is these bundles of cocoons, sometimes fifty to sixty in number, and perhaps attached to the shrunken skin of the host caterpillar, which attract attenion.

A third species deserving mention is a large predatory beetle† belonging to the family *Carabidae*. The beetle is an active and conspicuous, shining, dark-green insect about an inch long and half an inch wide; its larva is rather longer, more elongate in shape and brown and yellow in colour. Both stages, which are ground-frequenting, savagely attack and devour army worm caterpillars. Though mainly nocturnal in habit, they may sometimes be seen operating during the day, particularly in dense crops.

The application of a poison-bran bait to army worm swarms proved very efficient. The bait recommended contains half a pound of arsenic pentoxide, twenty-five pounds of bran, four pounds of molasses and two and a half gallons of water, and was distributed in and around the infested area. The bait attracted the army worms and they died soon after feeding on it. Such baits are normally used on areas of one acre or less, but some farmers with an army worm infestation evenly distributed through the crop baited much larger areas though under such conditions the amount of bait used was below the normal rate of fifty pounds (dry bran) per acre.

Faced with the necessity of controlling a heavy, though disperse, infestation of the pest over large areas, attention naturally turned to the insecticide DDT. The interest in this insecticide was greatest among farmers with summer cereal crops in the heading stage for, given freedom from insect damage during the following month, they could expect a profitable crop of grain. As a crop return of say £10 or more per acre might be at stake, an application of an efficient insecticide at this particular period could be a good investment. It was already known that a DDT spray was toxic against some other Noctuid larvae and it seemed reasonable to suppose that army worms could be controlled with the insecticide. Accordingly, trials were made, using, in most cases, improvized power-operated spray outfits fitted with a multi-nozzle, horizontal delivery boom about thirty-five feet long and mounted on a truck. At a concentration of 0.1 per cent., DDT sprays appeared to give good results as many dead larvae were seen on the ground and damage seemed to fall off sharply following the treatment.

These attempts at control are of particular interest as an indication of the practicability of using insecticides on a large scale in field crops now that more efficient materials are available than was the case some years ago. The cost of the materials used on this occasion was approximately 7s. 6d. per acre, which is well within economic limits. The area of crop damaged by the truck wheels was of no importance compared with the total area treated.

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* *Apanteles* sp.

† *Calosoma australis* Hope.

The Variegated Army Worm Outbreak.

Outbreaks of the variegated army worm have previously been recorded from districts as far apart as the Atherton Tableland and the Queensland–New South Wales border but it is seldom that the tract of infested country has been as large as in 1947. In March, reports from the Clermont district told of "moving hordes of striped caterpillars" attacking pastures on station properties. The reference to the striped body pattern of the caterpillars leaves little doubt that the variegated army worm was involved. Shortly afterwards, grass paddocks were eaten out in the North Coast highlands at Maleny and from then on, southern Queensland experienced its worst attack from the insect for very many years. Native pastures as well as paspalum pastures were infested. In the former, the development of the outbreak was conspicuous for the grasses were mainly of the stooling type and the damage could be easily recognized as the work of caterpillars. Actually, the populations were so dense that, though the larvae normally sought shelter during the day, many remained exposed in pastures of this kind. In paspalum and some other established pastures which have a matted sward, the activities of the pest passed unnoticed until brown patches appeared in the field. The existence of such brown patches in the late summer and autumn when the grass should have been making good growth immediately suggested that something was wrong. Examination of the damaged grass and the underlying soil usually disclosed the variegated cutworm, sometimes in incredibly large numbers. These caterpillars, like those of the army worm, fed mainly at night on the flag and stems. The brown colour of the infested sward was largely due to the collapse and death of the flag; the roots remained alive unless the attack was very heavy and prolonged. The death of the grass over a large area was unusual, for some roots invariably survived and growth was resumed once the outbreak had passed, provided of course, soil moisture was sufficiently high.

The variegated army worm was attacked by numerous parasites, the most conspicuous being an Ichneumonid wasp*. This wasp is blackish brown in colour with a laterally-compressed, curved abdomen and a very long, egg-laying tube through which it inserts its eggs into the body of the full-grown or almost full-grown caterpillar. The activity of these wasps often gave a clear indication of the whereabouts of the caterpillars, for they flew to and fro just above the infested area, even before the pasture showed any signs of injury. Flights of the wasp were so common in Southern Queensland that they attracted attention in bowling and other greens which are kept under fairly close observation.

Outbreaks of the variegated army worm are usually short-lived, primarily because parasites and predators increase very rapidly and few of the caterpillars complete their development. In 1947, however, the outbreak extended over approximately two months and included at least two generations of the insect between late February and early May. The second generation caused the greatest damage and the position in the field was, therefore, most acute in late April.

A number of other insects were associated with the variegated army worm in some infested areas. The more important were the

* *Lissopimpla semipunctata* Kirby.

grass moth* and the cluster caterpillar†, the larvae of which have rather similar habits to those of the variegated army worm. For the most part, however, they played a minor part in the outbreak.

As in the case of the army worm outbreak on the Darling Downs, farmers could either let the variegated army worm outbreak run its course, or apply control measures for the pest. In pastures, the loss to farmers is less than it would be in fodder crops and the economic urge to apply control measures was seldom considered pressing. Where poison-bran baits were distributed, good control was obtained. However, control measures were needed for golf and other greens as well as gardens where the use of arsenicals is undesirable. DDT sprays were recommended for such situations and, in practice, gave excellent results when liberally applied at a concentration of 0.1 per cent. Usually a single application to the obviously infested areas and the margins thereof proved adequate to reduce the infestation to negligible proportions.

The Greasy Cutworm Outbreak.

Cutworm outbreaks occur every year in some crop or other. The commonest species is known as the brown cutworm‡ but there are many other Noctuids with cutworm habits and it was not until some of the larvae collected in the field were reared to the adult stage that the importance of the greasy cutworm in 1946-47 was realized. Most cutworms behave in the same way. The larvae usually feed at night and shelter during the day just below the surface of the soil. Normally, they attack seedling plants at ground level, eating into the stalk to such an extent that the seedlings collapse. They may, however, travel up the stem and attack the foliage, but this type of injury is more common in well-grown plants than in seedlings.

Last spring, cutworm damage to cultivated crops was very little, if any, greater than usual, though larger populations than normal were noted in some crops. The main species involved was identified as the greasy cutworm. In the autumn, however, outbreaks were recorded in all the more important fruit- and vegetable-producing areas south of Gympie. An unusual feature was the infestation in strawberry plantings, for this crop is not normally attacked by the pest. The root and crown of the strawberry plant are more or less fibrous and thus quite different from the succulent stems of the seedlings which are more commonly attacked. However, these parts of the strawberry plant escaped damage, the larvae feeding on the leaf stalks which were either severed at the base or so severely injured that the leaf collapsed. Extensive defoliation of this kind tends to delay fruiting, though it may not diminish yields. The delay may, however, prevent the farmer from marketing his crop when prices are most profitable.

Applications of poison-bran baits along the rows gave effective control of the greasy cutworm. However, the outbreak provided the farmer with an opportunity to use DDT sprays against the pest. The insecticide has been used at a strength of 0.1 per cent., the spray being directed downwards to the base of the plant where it wets the stem and the adjacent soil. The cutworms apparently make contact with the insecticide when they move about at night and results have, in practice, been uniformly good. It seems probable, therefore, that this method of controlling cutworms will, in future, supercede the rather more cumbersome, though still dependable, baiting technique.

* *Psara licarsisalis* Walk.

† *Prodenia litura* Fabr.

‡ *Euxoa radians* Guen.

An Outbreak of Grass Webworm in Atherton Tableland Pastures.

R. C. CANNON, B.Sc.Agr., Entomologist, and A. HEGARTY, Q.D.A., Field Assistant.

A SERIOUS outbreak of the grass webworm* occurred on the Atherton Tableland in the vicinity of Peeramon in the early part of 1947, and was responsible for considerable destruction of pastures in that area. The insect has been recorded from various parts of the State, and an outbreak occurred in the Lockyer Valley in 1935. Webworms of related species are known in other parts of the world and sometimes attack cultivated crops, such as maize. In most cases outbreaks have been of a spasmodic, rather than recurrent, nature.

Life History and Habits.

The life history of this insect is not fully known. The adult (Fig. 1) is an inconspicuous, whitish-grey moth, fairly easily recognized by the projection of portions of the mouth-parts in front of the head, which is typical of Crambidae, the family to which this moth belongs. In repose the moth rests in a more or less vertical position, frequently clinging to upright grass stalks, with the wings furled around the body. It flies with a peculiar zigzag motion and flights rarely exceed a few yards at a time.

The eggs have not been observed, but presumably they are laid on the flag of the grass. In some species of this group, eggs may be laid during flight, when they fall and come to rest on the grass.

The young larvae (Fig. 2) are a dirty-grey in colour, with the segmentation of the body fairly distinct, and clothed with a few fairly stiff hairs. They make their way to the base of the young shoots of the grass, where they cut a more or less circular hole through the sheathing leaves and proceed to tunnel into the growing tissues. In doing so they cut off many of the younger leaves and eventually destroy the growing tip and flag. Apart from the initial perforation of the young shoots, they do not appear to consume the sheathing leaves, which simply collapse and remain on the surface of the stool. As they feed they produce a small amount of light webbing which helps to protect and conceal them. When fully grown, the larvae attain a length of about ½ inch and take on a darker colour, the segmentation of the body becoming still more conspicuous.

When fully fed the larva spins a more dense silken shelter in or near the base of the stool, where pupation takes place. The pupa (Plate 3) is brown in colour, about ½ inch long, and in general appearance much like many other moth pupae. From this pupa, the adult moth emerges to commence the next generation.

Seasonal Life History.

The damage in the Peeramon area was first apparent in February when the larvae were actively feeding and their presence was quite obvious. By March, large numbers of moths were on the wing and larvae were still in evidence in April, though their numbers had by

* *Calamotropha leptogramella*, Meyr.

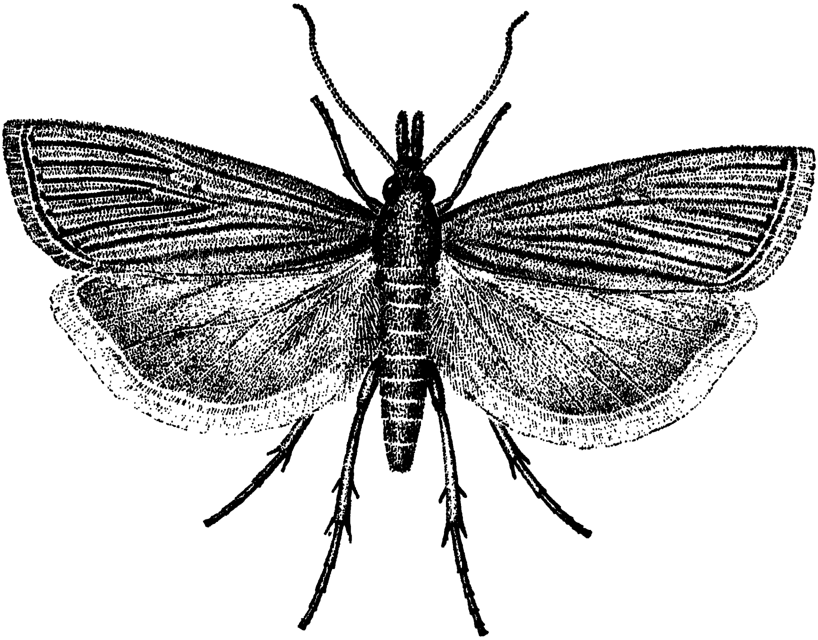


Fig. 1.

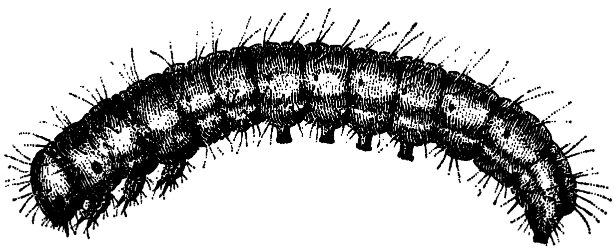


Fig. 2.

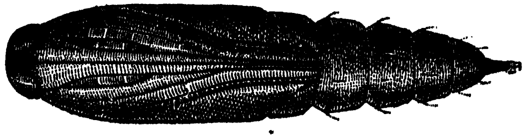


Fig. 3.

Plate 146.

Grass Webworm: Fig. 1—Adult moth × 6; fig. 2—larva × 8; fig. 3—pupa × 7.

this time declined considerably. It seems, therefore, that two generations must have occurred over the period February to April, when most of the damage was done. Odd larvae could still be found as late as June but the damage being produced at that time was negligible.

Some of the species which have been studied overseas are known to over-winter in the larval stage. Whether this is the case also with this species is not known, but it could quite well be so.

Natrue and Extent of Damage.

In the outbreak in question the grass affected was paspalum,* the principal pasture species in the Malanda area. In feeding the larva does not consume the flag but concentrates on the base of the growing point, producing a more or less spiral excavation of these tissues (Fig. 4). The growing point is effectively destroyed and no further growth takes place, the sheathing leaves dying back as a result of the injury sustained by them. Though it is not certain, it is presumed that a single larva may feed on more than one growing point, destroying several during the period of its actively feeding life.

Fig. 1.

Fig. 2.

Plate 147.

PASPALUM SHOOTS DAMAGED BY GRASS WEBWORM.—Note circular holes made by the larvae. Fig. 1—front view; fig 2—side view.

The grass affected fairly quickly assumes a browned-off appearance consequent on the destruction of young growth and the natural death of older leaves. For a time the dead tissue remains in place but, due to the action of wind and weather, gradually disappears exposing the browned stolons. In many respects the pasture presents much the same appearance as that associated with white-grub† activities but closer examination shows that the root system is intact. In addition, it has not the ruffled appearance of white-grub infested pastures. In the outbreak under discussion it was noted that there was often an overlapping of grass webworm and white-grub infestation. In some areas the pastures showed symptoms of both types of injury, whilst in others the damage was entirely due to the webworm.

* *Paspalum dilatatum.*

† *Lepidiota caudata,* Blkb., etc.

The outbreak was centred in the area in the vicinity of Peeramon, where the most spectacular damage occurred. In the Mt. Quincan–Kureen–Peeramon triangle of country the pasture damage was almost entirely due to the activities of the grass webworm, whilst on adjacent areas the webworm was responsible for damage of a lesser magnitude. It has been estimated that the pest was present in some 5,000 acres of grassland in the area, though probably only half of this area was heavily infested and suffered severe injury.

In view of the fact that the root system had been in no way impaired, it might have been expected that recovery would be more rapid than in pastures attacked by white grubs. Unfortunately, the outbreak did not subside until after the cessation of the monsoonal rains, and conditions were then not favourable for a rapid recovery. Following light rains in May, odd green shoots appeared in previously damaged pastures but recovery was extremely slow and little further improvement took place before the spring rains. On the other hand, weed growth has proceeded more or less unchecked and may become an important factor in retarding grass recovery. The principal weeds in the succession were star burr, blue top and farmer's lice*.

Predisposing Factors and Natural Control.

The species in question is native to Australia and is normally heavily parasitized. There is reason to believe that this insect is present each season in the Peeramon area without causing any spectacular damage, presumably due to the controlling influence of parasites. The months prior to the webworm outbreak of 1947 were exceptionally dry, the Atherton rainfall for the period November, 1946, to January, 1947, being 749 points as against an average of 2,160 for the same period. It is considered that this abnormally dry period may have so interfered with parasite survival as to allow the pest temporarily to get out of hand. This explanation probably accounts for the long periods between outbreaks of the webworm in Queensland, and it may be many years before a similar outbreak occurs.

Control.

Insecticidal control of this pest is possible though, perhaps, difficult at times on account of the nature of the terrain. Control may be effected by the application of a 0.1 per cent. DDT spray or a 2 per cent. DDT dust to affected areas; the strengths of DDT are given in terms of the para para isomer content. Similar results may also be expected with Gammexane dust (with a 0.4 gamma isomer content) when this material becomes available commercially. On account of the sporadic nature of the outbreaks, no full-scale insecticidal trials have been possible, but a small-scale trial has proved these insecticides very effective.

Successful and economic control of the pest will depend very largely on early recognition of the trouble and prompt application of control measures. Once the attack has spread a considerable area of country may be involved and the cost of insecticides and their application may become excessive. It is considered that a single early application of one of these insecticides may be expected to bring an outbreak under control in a short space of time.

* *Acanthospermum hispidum, Ageratum conyzoides* and *Siegesbeckia orientalis.*

PRODUCTION RECORDING.

List of cows and heifers, officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. and Jersey Societies' Herd Books, production records for which have been compiled during the month of October, 1947 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.).			
Tara Tia 4th	C. K. Roche, Wheatvale	9,140·75	358·306	Murrays Bridge Pansy's Gift
	JUNIOR, 4 YEARS (STANDARD 310 LB.)			
Tabbagong Lucy 20th	J. Crookey, Allora	10,482·75	381·802	Park View Paymaster
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Navillus Shannon 11th	C. O'Sullivan, Greenmount	8,366·95	336·236	Greyleigh Eros
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Arolla Beauty 9th	J. Crookey, Allora	6,293·85	248·456	Fairthorn Rainbows Prince
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Gem May (365 days)	W. Bishop, Kenmore	15,065·2	923·607	Ardroy Laces Volunteer
Brookland Sultana Cake	W. S. Conochie, Sherwood	8,377·75	492·786	Brookland Royal Sultan
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Glenrandle Nisa 2nd (251 days)	P. Kerlin, Killarney	7,186·8	381·973	Bellgarth Stylish
Lilyvale Brown Lady	I. Jensen, Stockyard Creek	6,128·3	325·209	Carfield Curly's Master
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Glenrandle Larkspur (251 days)	P. Kerlin, Killarney	8,218·4	442·66	Bellgarth Glory King
Nairfale Neat Neta	R. J. Browne, Yangan	6,928·8	386·02	Nairfale Count Paymaster
Wattle Vale Doreen	I. Jensen, Stockyard Creek	5,693·85	316·281	Winera Pansys Officer
Bellgarth Lily Light 2nd	D. R. Hutton, Cunningham	5,657·3	308·391	Oxford Fawn's Victor
Wattle Vale Pansy	I. Jensen, Stockyard Creek	5,442·25	305·851	Winera Pansys Officer
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Trinity Bright Lass	J. McCarthy, Greenmount	5,204	250·392	Trinity Crowning Effort
Hopewell Vanity	G. Harley, Childers	4,966·45	248·355	Trinity Daffodil's Design
Wattle Vale Duchess	I. Jensen, Stockyard Creek	4,560·85	237·694	Sunny Glen Lucky Boy

MARKETING

Production Trends, November.

Seasonal storm rains occurred at frequent intervals throughout November, and by the end of the month practically all farming and dairying districts had received better than average rains.

Milk and cream supplies are at a high level and are increasing. The smothering of cream-tainting weeds by the luxuriant pasture growth has caused almost a complete absence of weed-tainted cream. Some cream supplies are being down-graded because of the failure of producers to take adequate precautions against hot-weather deterioration.

Wheat harvesting commenced late in October, and good progress was made during November under generally favourable conditions until late in the month when the continued heavy rains made harvesting impossible. Yields were particularly high in many districts and although some losses will be occasioned by the wet conditions it is not possible at this stage to assess what damage has been done to the crop.

Interest in peanuts has increased in all areas where this crop can be grown, and a record planting is assured. To date 45,000 acres in the South Burnett and 5,000 acres in the Monto districts have been planted, and planting is continuing.

Harvesting of the linseed crop on the Darling Downs is expected to commence immediately. The crop appears to be suitable for the district and promises yields of approximately 4 bags. Improved yields may be expected when the crop becomes acclimatised.

Sorghum Growers' Voluntary Pool.

In November, Queensland sorghum growers formed a Co-operative Association to handle the sale of the surplus sorghum resulting from last season's record crop, which remained in growers' hands. The Commonwealth Government has agreed to grant an export permit up to 600,000 bushels, and has requested the Queensland Department of Agriculture and Stock to supervise the export arrangements.

Export permits will be issued exclusively to The Sorghum Growers' Co-operative Association Limited, and this Association will be required to accept into the pool any grain sorghum of merchantable quality of the 1947 harvest delivered by a sorghum grower. The Association will be required to pool and to sell all grain on behalf of the growers either on the local or the export market, and to return the net proceeds of sales to the growers concerned in accordance with the grades and qualities of grain delivered.

Potato Marketing Board.

It has been announced by the Minister for Agriculture and Stock (Hon. H. H. Collins) that Messrs. M. W. Reeves, Imbil; C. F. Giffard, Home Hill; T. J. Ford, Gatton; W. Utz, Mount Tarampa; and J. J. Dwyer, Gap View, via Kalbar, have been elected as growers' representatives on the Potato Marketing Board for the three-year term commencing 1st January, 1948. The counting of votes, which took place at the Department of Agriculture and Stock on 18th December, 1947, resulted as follows:—

	Votes.
District No. 1—Central.	
M. W. Reeves, Imbil	186
G. F. A. Beitzel, Murgon	167
District No. 2—Northern.	
C. F. Giffard, Home Hill	94
J. McF. Blyth, Woodstock	31
District No. 3—Southern.	
T. J. Ford, Gatton	921
W. Utz, Mount Tarampa	903
J. J. Dwyer, Gap View, via Kalbar	871
F. H. Steinhardt, Gatton	671

GENERAL NOTES

Staff Changes and Appointments.

The following appointments in the Division of Plant Industry, Department of Agriculture and Stock, have been announced:—

Dr. L. G. Miles, B.Sc.Agr., Ph.D., Senior Plant Breeder in the Division, has been appointed Senior Plant Breeder, Agriculture Branch. Dr. Miles was granted a scholarship in Plant Breeding at the Queensland University in 1930 and subsequently travelled abroad for further training in America and England. Whilst overseas, Dr. Miles obtained his Doctorate in Philosophy at Cornell University (New York). He took up his appointment as Plant Breeder in the Department in 1934.

Mr. W. J. Cartmill, B.Sc., A.A.C.I., Soils Chemist, Division I., Agriculture Branch, has been appointed Senior Soils Technologist, Agriculture Branch.

Mr. W. J. S. Sloan, M.Sc.Agr., Agronomist, Division I., Sugar Experiment Stations, has been appointed Senior Agronomist, Agriculture Branch.

In the Division of Animal Industry, Messrs. R. B. Young and H. D. Hallam have been appointed Senior Advisers, Sheep and Wool Branch. Mr. Young will be stationed at Longreach and Mr. Hallam at Dalby.

Mr. J. N. Rea has been appointed Adviser, Sheep and Wool Branch.

The following appointments in the Bureau of Sugar Experiment Stations, Division of Plant Industry, Department of Agriculture and Stock, have been announced:—

Mr. L. G. Vallance, M.Sc., Chemist, Division I., has been appointed Senior Soils Technologist;

Mr. J. H. Buzacott, M.Sc., Entomologist, Division I., has been appointed Senior Plant Breeder; and

Mr. George Wilson, B.Sc., has been appointed Entomologist, Division II., on probation, with headquarters at the Sugar Experiment Station, Meringa, near Gordonvale.

Cane Growing Assignments to Ex-Servicemen.

Commenting on the granting of cane-growing assignments to discharged servicemen under *The War Service (Sugar Industry) Land Settlement Act of* 1946, the Minister for Agriculture (Hon. H. H. Collins) said recently that he had been informed that, following submissions by the Land Administration Board regarding the settlement of ex-servicemen in four mill areas, viz., Mulgrave, Babinda, Mossman, and Hambledon, the Central Sugar Cane Prices Board, after due consideration, has decided that it is prepared to approve of assignments affecting 82 growers in these areas. Fifty assignments have been approved for landless ex-servicemen, 24 for landholders, or holders of an option on approved land, and 8 increases in assignments. It is computed that these additional assignments would provide for an increase in production of some 53,000 tons of cane.

Mr. Collins added that where Crown land was involved the Land Administration Board would hold a ballot among eligible applicants, and when the said lands are allotted assignments would be granted. The Central Sugar Cane Prices Board would issue assignments to successful applicants in all categories on being advised by the Land Administration Board that such successful applicants hold a lawful title to the land to be assigned. Consequently, the eligible holders of approved land or options, and approved applicants for increased assignments would be enabled to get into production at an early date.

"It was interesting also to note," said Mr. Collins, "that under the priority of purchase provisions of the Act, 164 farms had already been secured by eligible ex-servicemen, and in many of those cases finance was provided by the Agricultural Bank."

Rural Topics

Lessons from Denmark.

Denmark is a country which has a lot of interest for many Australian farmers, probably because agricultural co-operation and education are so highly developed there. As a dairying country, Denmark also is, or, rather, has been (and probably will be again) one of our keenest competitors on the British butter market. We are indebted to Denmark for the valuable lessons in marketing methods and organization along the lines of practical farmers' co-operation. What is happening in Denmark to-day, what are the farming conditions there now, and how is she recovering from the German occupation?

Denmark has resumed the exportation of primary products to Britain and reorganization is under way with the object of re-establishing the pre-war volume of consignments to the British market. Denmark is in full production again, and with the effects of the war and the long German occupation forgotten. Can Denmark still give a lead in general farming practice and in the fields of research and education? It is a little nation with a big reputation and, in area, not very much larger than one of our more extensive North Australian cattle stations. The population is about 4 millions, of whom about a fourth live in its capital city, Copenhagen.

Farming in Denmark is on an intensive scale. The average size of a Danish dairy farm is from 40 to 50 acres, carrying up to 25 cows. A farmer who owns 100 acres is the big man of his district, but such an area would be subdivided into farming units, each supporting at least one family. Dairying in Denmark is hardly comparable with dairying in Queensland, because of the severity of the Jutland climate. For about six months or so of every year cattle have to be housed and stall fed. During the other half of the year the cattle are on sown pasture, made up, in addition to grass, largely of clover, lucerne, and green oats. Each cow is tethered on a chain about 10 to 12 yards long, a steel spike being driven into the ground as an anchor and the whole herd extended across the field in a straight line. Each morning the line is moved forward a further 10 or 12 yards, and so the procedure is repeated until the whole paddock is eaten out. The cattle are then moved to another paddock, and so the process goes on. When back in the stalls for winter housing, the cattle receive a regular balanced ration, to which is added brewers' grains and cereal meals and other available feeds. Pig raising, regarded as of equal importance, is combined with dairying. Tiny flocks of sheep and working horses are usually included in the farm stock. Agriculture is combined, of course, with the pastoral side of the farm, and every farm has normally the greater proportion of its acreage under crop. In general, the farm area is divided into eight equal parts, and a most efficient system of crop rotation is practised. Each year a different crop is sown, and practically about seven-eighths of the farm is ploughed annually. Denmark has mostly maintained its productivity by the careful use of natural manure and systematic rotation of crops.

The amount of modern agricultural research carried on in Denmark is remarkable for its thoroughness and its application to farming the world over. Throughout the country there is an efficient system of Government-sponsored agricultural schools. These schools are situated in the heart of the farming areas and are worked in conjunction with a good farm. The primary object of these schools is to provide practical, theoretical, and technical education to farmers' sons and farm workers while they are actually engaged in farming. Fees are very low, and are based on a sliding scale. The co-operative principle is applied to Danish rural industry in every practical way, including long and short-term credits, and extends to the co-operative control and use of farm machinery. In Danish farming one fact stands out boldly, and that is: the highest standard of quality is the hallmark of the primary commodities they send to the export market—a fact well worth full appreciation in respect of a serious competitor in our own export trade in primary products.

GADGETS AND WRINKLES

TANK SINKING.

The drains leading to a tank should be wide and shallow rather than narrow and deep, the flow of water in a shallow drain being slower and the amount of scouring consequently less. A drain 4 feet wide and 9 inches deep is much better than one 2 feet wide and 18 inches or 2 feet deep.

When scouring is likely to take place the following method is very successful in preventing it:—

A trench about 1 foot wide and 18 inches deep, and extending a couple of feet each side of the drain, is dug across it and filled with stone of 2 or 3 inch gauge. The efficacy of aprons such as this can be seen along roads and railways where they are used for the prevention of wash-aways.

Where drains curve they should be widened; the sharper the curve the greater should the width be, and as a double safeguard an embankment can be placed on the outer side. Should drains meet before reaching the tank the main drain should be widened at the confluence, and the junction made at an acute angle. Otherwise considerable quantities of silt will settle.

It is highly desirable that the drains be run as far as possible on an even grade, and an ordinary home-made level such as used in erosion work is ideal for securing a regular and even grade. Its use would obviate much of the erosion and silting so often seen in drains leading to tanks. Further, properly constructed and gently sloping drains tend to serve a larger catchment area than if an attempt is made to slope the drains steeply and to rely entirely upon the eye for their placement, etc.

Drains should always be kept in first-class order. When surface tanks are depended upon every shower is of importance, and unless the drains are clean, water from light showers does not reach the tank. Light road delvers are very useful for cleaning drains, but if the size of the holding does not warrant the purchase of such a delver, a crowder or delver should be made from a log or plank by the fitting of a steel point. A plough or shovel can also be used for this purpose.

On small holdings, where the tanks can be kept under observation, some means should be devised to divert the water as soon as the tank is full. If the water is allowed to continue to flow into the tank it gradually silts up, and the water which overflows is clearer than the water which is flowing in.

A chute should be provided where the pipe enters the tank, and a drain made right round the edge, leading to the chute, for the purpose of preventing water from running down the banks and causing scouring.

Usually one silt tank is provided, but it is a decided advantage to have two or more, as then more silt is deposited and the water reaches the tank in a cleaner condition. Every possible opportunity should be seized upon to keep the tanks clean. They should be kept under constant observation, and whenever the water gets low as much silt as possible should be removed. Many landholders have discovered at the commencement of a drought that tanks which they had thought contained several feet of water actually contained several feet of silt and only a few inches of water.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BETWEEN TWO YEARS AND SIX—THE RIGHT HEALTH HABITS.

Exercise and Play.

All good parents are anxious that their boys shall grow up strong, healthy young men and their girls into attractive, healthy young women.

Having the right kind and amount of exercise and play is one of the first health habits which should be developed. Children who are well should play as long as possible every day in the open air. When the weather does not permit of going outdoors they should play on a sheltered veranda or in a room with the windows open. Active play is most important for children because it—

1. Makes the heart beat faster, speeding the flow of blood through the body and thus carrying more food to all the tissues and accelerating the output of waste matter through the skin and other organs.
2. Makes the child breathe faster and more deeply, thus bringing more air into the lungs and more oxygen into the blood.
3. Increases the appetite and helps digestion.
4. Helps make the muscles firm and strong, aids in correct posture and gives grace to movement; develops skill and self-control.

Play is the child's way of expressing himself and he should have plenty of play material. This does not mean expensive toys. For outdoors there should be provided sand, water, swings, climbing frames, carts and other toys which will move; indoor for wet days or to help the recovery of a sick or undernourished child, toys that will develop a skill and keep the child interestel, like blocks, finger paints, counting trays, peg boards, and so on.

Walking should be encouraged and made interesting by pointing out the beauties of nature and explaining to the children the things which they see around them on their walks. Teach them to enjoy the wind and the soft rain on their faces and the warmth of the sun on their bodies. All children should be taught to swim and as they get older should join in team games like cricket and tennis.

Parents of only children should remember that every child needs the company of other children. The joy of exercise and play is greatest when he plays with children of his own age.

Do not allow children to exercise to the point of being overtired. A little rest with or without sleep after exertion will help to prevent over-fatigue in the very active child. Early health habits help to maintain fine mental and physical condition in later life.

Any advice on play for children of different ages and any other matters concerning the health of mother and child may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 *St. Paul's Terrace, Brisbane*, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

NURSING AS A CAREER FOR COUNTRY GIRLS.

To become a nursing trainee a girl must be no younger than 17 years and have attained the State School 7th Grade, or its educational equivalent. Any girl with higher educational attainments seeking a professional career leading to a position of administrative responsibility would find in trained nursing the way of achieving her ambition. The period of training for a general trained nurse is four years. The study course is very interesting, the knowledge gained being of inestimable value in all walks of life whether a girl continues in the nursing profession or not. The commencing salary for a trainee of 17 years of age is £1 13s. 9d. a week, with yearly increases during the period of training. Trainees are provided with excellent accommodation in the Brisbane Hospital (also in other base hospitals), separate rooms being provided in the Nurses' Home block in the hospital grounds. A large recreation room with piano, wireless set, sewing machines, and library are provided for the use of nurses, as well as adequately equipped lounges. Meals of a high standard. Bathrooms are supplied with hot and cold water. Accommodation, meals, and uniforms are provided without charge. Uniforms also are laundered without charge.

On the successful completion of her period of training a nurse may, if she so desires, enter on a short course of training (9 months) to qualify as an obstetric nurse and may thus become a "double certificated" nursing sister, qualified for appointment to any position (including that of matron) in any hospital.

Opportunities for travel are available to trained nurses, and because of reciprocity of registration among Australian States and overseas countries they are assured of positions in most countries.

The Brisbane and South Coast Hospitals Board, *Brisbane Base Hospitals Post Office, Herston road, Brisbane,* will supply further particulars to any girl who is considering nursing as a worthwhile career.

IN THE FARM KITCHEN.

Stuffed Pancakes.

Half pound sausage meat, 1 teaspoon parsley, or half of mixed herbs, 1 teaspoon meat extract, a little onion or leek, salt and pepper. Fry the onion in a little fat, and add the sausage meat. Mix them together in the pan, stir in the meat extract, salt and pepper, and the parsley or herbs. Moisten with a little boiling water and allow to simmer gently. The sauce (about two teacups of ordinary white sauce, made with milk and two tablespoons of grated cheese stirred in) will keep warm while you make six very thin pancakes, using your usual egg batter. As you finish each pancake fill it with the stuffing mixture, roll it up and put it in a hot fireproof dish. Arrange the pancakes in a neat row, pour over the sauce, and put the dish in a hot oven, or under the grill, for ten minutes. Enough for three or four persons.

Casserole of Mutton.

One and a half pounds neck of mutton, ½ pint diced carrot, 1½ gills diced turnip, 2 oz. butter or mutton fat, 2 level tablespoons plain flour, salt and white pepper to taste, ¾ pint mutton stock. Divide the meat into neat chops or cutlets. Prepare vegetables. Melt the fat in a frying-pan until it starts to smoke. Dip vegetables in the flour, then add. Fry slowly till turning colour. Remove to casserole. Sprinkle chops or cutlets with salt and pepper. Fry on both sides in remainder of fat in frying-pan. Turn chops into casserole. Add stock. Cover closely. Simmer until tender on top of stove with an asbestos mat between casserole and ring or hot plate, or bake in a slow oven for about two hours. Serve with boiled or mashed potatoes. Enough for five or six persons.

QUEENSLAND WEATHER IN NOVEMBER.

During November there were relatively few places in the Carpentaria and western border districts of the State which received little or no benefit from the otherwise state-wide distribution of a series of seasonal thunderstorms, which by the end of the month resulted in aggregate totals of several inches in many districts of the south-eastern quarter, particularly the Downs and south coast areas. Variable thunderstorm rain weather again mainly in the south-east divisions, continued for the first three days in December, and there were also useful supplementary falls in parts of the Carpentaria, most of the Central Highlands and central coast districts.

In the wheat areas the heaviest rain came towards the end of the month, and, although the greater part of the harvesting had been completed, poorer results from local storm damage and unstripped water logged areas would decrease to some extent the previously estimated record yield of 11 to 12 million bushels.

With the latest improvement in the central coast areas, the greater part of the State, especially the southern half, has experienced a good to exceptional spring season with ample general pastures, higher milk yield and favourable agricultural conditions. Fruit setting and early ripening crops of the Granite Belt were hampered by the excessive rain and some local storms.

Local heavy thunderstorm rains, with some hail damage, were reported with the worst conditions at Charleville on Sunday, 23rd, when a terrific hailstorm was accompanied by 66 m.p.h. winds. The storm on a four mile front lasted 17 minutes and caused damage estimated at £150,000. Practically all windows were broken, iron roofs dented and penetrated, some poultry and animals killed, and several persons injured. Hail stones as large as 5 inches in circumference were measured.

Some heavy daily falls included 351 points at Mossman (19th); Charleville 269, Muckadilla 266, Dulacca 261 (24th); Bell 341, Macalister 300, Moore 338, Yarraman 323 (29th), Giru 368 (29th), Gympie 347 (30th).

High monthly totals in the South Coast Moreton included many five to eight inch amounts, up to 1,124 points at Gympie and 1,039 at Theebine. In the Port Curtis district Goodwood registered 899 points and Rosedale 969. The East Downs ranged from three to over seven inches, up to 913 points at Warra and on the West Downs Condamine and Columboola had 544 points, and in the Maranoa, Yuleba 563.

Stream rises Downs and South Coast.—Apart from local district flooding in low-lying areas, by the end of the month heavy aggregate rains had steadily increased general stream flows, and by the 2nd December some moderate flood heights were reported from the Condamine and Macintyre basin, and at Murrumba on the Brisbane River on the 3rd December flood height over the bridge resulted, chiefly from heavy rain on the inland watershed.

Temperatures.—Apart from slightly above normal readings in the Palmerville-Georgetown districts, maximum temperatures were generally below normal from 1.5 degrees at Cairns to 3.8 deg. at Thargomindah. Minimum temperatures also, except at Cairns and Palmerville, were also mostly well below normal, as much as 4.3 degrees at Thargomindah. Camooweal recorded over 100 degrees on 17 days, and Donors Hill and Richmond 15. Normanton reported 108 degrees on the 11th and 17th. Bybera and Stanthorpe reported a grass minimum temperature of 32 degrees (6th).

Brisbane.—Mean pressure $\frac{9+3}{2}$ 29.913 inches (normal 29.958). Temperatures—Mean maximum 78.6 deg. (normal 82.3 deg.), lowest since 1933 (76.6 deg.). Mean minimum 63.2 deg. (normal 64.3 deg.), lowest since 1935 (63.2 dep.). Mean temperature 70.9 deg. (normal 73.4 deg.), lowest since 1933 (70.0 deg.). Highest daily reading 89.7 deg. (4th); lowest 57.0 deg. (12th). Rainfall—280 points on 12 days; Sunnybank 157 points in less than half an hour with some hail in south-west suburbs as large as pigeons' eggs. 30th, 9.13 p.m., wind gust of 53 miles per hour from S.S.E. in heavy thunderstorm.

The rain position is summarised below—

Division.	Normal Mean.	Mean November, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	199	99	50 below
Peninsula South	220	168	24 „
Lower Carpentaria	148	155	5 above
Upper Carpentaria	153	135	12 below
North Coast, Barron	298	391	31 above
North Coast, Herbert	353	460	30 „
Central Coast, East	206	219	6 „
Central Coast, West	161	347	116 „
Central Highlands	220	191	13 below
Central Lowlands	148	196	32 above
Upper Western	105	58	45 below
Lower Western	89	32	64 „
South Coast, Port Curtis	272	518	90 above
South Coast, Moreton	357	541	51 „
Darling Downs, East	277	435	57 „
Darling Downs, West	232	479	106 „
Maranoa	211	384	82 „
Warrego	147	236	61 „
Far South-West	109	133	22 „

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

JANUARY.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.56	6.46	Cairns	48	9	Longreach	48	27
6	5.00	6.47	Charleville ..	29	25	Quilpie	33	37
11	5·04	6.47	Cloncurry	63	36	Rockhampton ..	18	2
16	5.08	6.47	Cunnamulla ..	28	31	Roma	19	15
21	5.12	6.46	Dirranbandi ..	16	22	Townsville ..	40	9
26	5.16	6.45	Emerald	27	12	Winton	51	30
31	5.20	6.43	Hughenden ..	48	22	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.

Date.	Rise.	Set.
	p.m.	a.m.
1	10.42	9.22
2	11.17	10·27
3	11.49	11.29
		p.m.
4	..	12.28
	a.m.	
5	12·22	1.27
6	12.55	2.25
7	1.30	3.23
8	2·09	4.21
9	2.52	5.17
10	3.39	6.10
11	4.31	6.59
12	5·25	7.44
13	6.20	8.23
14	7.15	8.58
15	8.09	9.30
16	9.02	9.59
17	9.55	10.28
18	10.48	10.57
19	11.43	11.28
	p.m.	a.m.
20	12.40	..
21	1.41	12.02
22	2.46	12.41
23	3.53	1.27
24	5.01	2.22
25	6.05	3.25
26	7.03	4.35
27	7.52	5.48
28	8.35	7.00
29	9.13	8.10
30	9.48	9.15
31	10·22	10.18

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	15	24	31	40	6	16	35	47
6	24	13	41	28	16	3	47	32
11	30	10	46	24	21	0	53	27
16	23	16	39	32	14	8	45	36
21	13	25	28	41	3	16	31	47
26	11	29	26	44	1	20	29	52
31	21	18	38	34	12	9	43	38

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	20	41	44	58	29	44	18	35
3	31	30	51	50	35	35	25	25
5	36	19	55	43	40	28	30	17
7	46	9	62	36	47	22	38	9
9	53	4	67	33	50	19	44	5
11	55	4	68	33	51	19	45	5
13	51	9	65	36	49	22	42	9
15	43	17	59	42	44	27	36	16
17	34	27	53	48	38	33	28	23
19	23	37	46	56	30	41	20	32
21	13	42	39	59	24	44	12	36
23	6	51	35	64	20	50	6	43
25	5	55	35	67	19	52	5	45
27	12	48	38	62	23	48	11	40
29	23	38	46	56	30	41	20	33
31	34	26	54	47	38	33	29	22

Phases of the Moon.—Last Quarter, January 3rd, 9.13 p.m.; New Moon, January 11th, 5.44 p.m.; First Quarter, January 19th, 9.32 p.m.; Full Moon, January 26th, 5.11 p.m.

On January 15th the Sun will rise and set about 23 degrees south of true east and true west respectively, and on January 3rd, 18th, and 30th the Moon will rise and set approximately at true east and true west respectively.

Earth in Perihelion.—On January 2nd the earth will reach that part of its orbit at which it will be nearest the Sun. There will then be 91⅓ million miles between the two bodies.

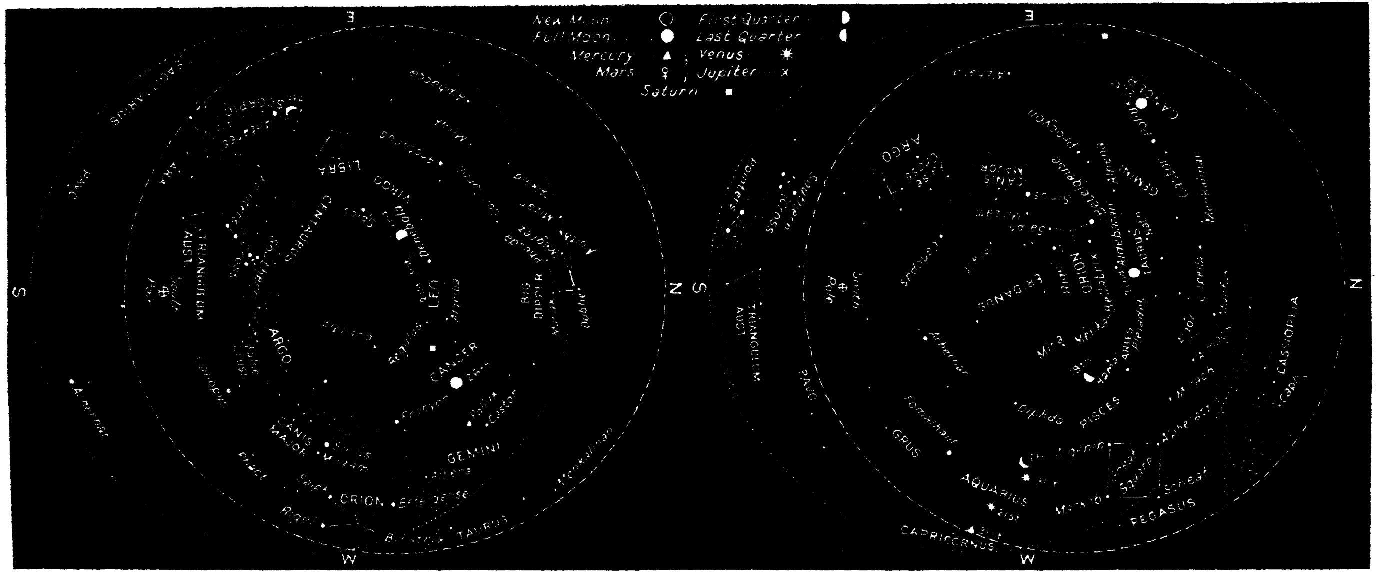
Mercury will not be visible until the later part of the month, being in line with the Sun on the 3rd. At the end of the month, in the constellation of Aquarius, it will set 1 hour 21 minutes after the Sun.

Venus, at the beginning of January, in the constellation of Capricornus, will set about 2 hours after the Sun, and by the end of the month will have almost passed through the constellation of Aquarius, when it will set between 8.30 p.m. and 9.45 p.m.

Mars during this month, in the constellation of Leo, will not show much movement in relation to the stars, being stationary on the 9th. On the 1st it will rise between 10 p.m. and 11.15 p.m., and on the 31st will rise between 8 p.m. and 9.15 p.m.

Jupiter, in the constellation of Ophiuchus, may be seen low in the east during morning twilight, rising 1¾ hours before the Sun on the 1st and nearly 4 hours before the Sun on the 31st.

Saturn.—This planet and Mars will be about equal distances on opposite sides of Regulus. On the 1st Saturn will rise between 9.15 p.m. and 10.15 p.m., and on the 31st between 7 p.m. and 8.15 p.m.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th January. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 7 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th, and at the end of the month about one hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

NOVEMBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of years' records.	Nov. 1946.	Nov. 1947.
North Coast.	In.		In.	In.
Atherton	2·60	42	1·05	5·47
Cairns	3·81	61	1·18	4·70
Cardwell	4·14	71	1·93	7·24
Cooktown	2·45	67	Nil	1·32
Herberton	2·68	57	0·66	5·70
Ingham	3·75	51	0·44	3·19
Innisfail	6·25	62	2·21	5·15
Mossman	5·75	19	1·78	4·65
Townsville	1·87	72	0·16	5·90
Central Coast.				
Ayr	1·67	56	0·28	2·87
Bowen	1·24	72	0·34	0·79
Charters Towers ..	1·43	61	1·17	3·86
Mackay	3·05	72	0·60	2·70
Proserpine	2·82	40	0·76	3·02
St. Lawrence ..	2·40	72	1·31	1·75
South Coast.				
Biggenden	2·90	44	2·08	4·41
Bundaberg	2·79	60	3·45	7·66
Brisbane Bureau ..	3·75	95	0·84	2·80
Caboolture	3·51	67	2·13	7·41
Childers	2·81	48	3·19	6·55
Crohamhurst.. ..	4·55	50	1·51	6·38
Esk	3·25	56	0·93	3·80
South Coast—cont.	In.		In.	In.
Gatton College ..	2·87	44	1·27	6·04
Gayndah	2·97	72	2·93	2·93
Gympie	3·33	78	1·34	11·24
Kilkivan	2·66	62	0·99	5·57
Maryborough ..	3·20	72	1·47	5·06
Nambour	4·21	47	1·50	7·73
Nanango	2·86	61	2·55	5·16
Rockhampton ..	2·48	72	2·89	4·24
Woodford	3·29	55	1·75	5·50
Central Highlands.				
Clermont	2·15	47	1·93	2·50
Springsure	2·39	74	1·25	1·91
Darling Downs.				
Dalby..	2·80	78	1·48	7·11
Emu Vale	2·81	47	1·60	2·83
Jimbour	2·50	64	1·58	5·79
Miles	2·58	58	2·45	5·25
Stanthorpe	2·76	70	3·24	3·33
Toowoomba	3·33	71	2·41	4·92
Warwick	2·66	78	1·91	3·24
Maranoa.				
Roma	2·17	69	0·69	1·98
St. George	1·75	62	0·46	3·33

CLIMATOLOGICAL DATA FOR NOVEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	86	71	96	25	66	15	470	7
Herberton	..	85	59	93	15	48	26	570	10
Townsville	..	88	73	98	5	65	26	590	8
Rockhampton	29·91	86	65	95	10	55	19	424	12
Brisbane	29·95	79	63	90	4	57	12	280	12
Darling Downs.									
Dalby	..	83	55	91	22	47	6	711	12
Stanthorpe	..	74	52	85	22	39	6	333	12
Toowoomba	..	77	55	87	22	44	6	492	13
Mid-Interior.									
Georgetown	29·86	97	69	105	10	53	6	197	4
Longreach	29·88	95	67	105	9	57	5, 6	120	4
Mitchell	29·89	86	59	98	9	46	6, 11	355	8
Western.									
Burketown	..	99	82	107	11, 14, 16, 17, 18	61	6	161	4
Boulia	29·86	95	67	106	21, 30	57	5	18	3
Thargomindah	29·86	88	63	101	21	52	4, 5	188	5

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